# GAS JOURNAL

## LIGHT ✂ HEAT ✂ POWER ✂ BYE-PRODUCTS

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VOL. CLXXVI., No. 3318.] WEDNESDAY, DECEMBER 22, 1926. [78TH YEAR.


A
Merry Christmas
to our Readers
and their Families.

## EDITORIAL NOTES.

### Confounding the Gas Price Critics.

SOME newspapers glory in what are known as "stunts," in the hope that they will arrest public attention, and create an agitation. If the assault is made against a public utility industry, so much the better. Such industries are supposed by small-minded people to have no souls and no honour. The newspapers are a little more chary about attacking a private individual, and injuring, through promoting prejudice, his trading or other interests. Some newspapers have been indulging in the absurdity of suggesting that gas undertakings are avaricious, and unnecessarily clinging to the higher prices for gas which were necessitated through the purchase of foreign coal to maintain the supply of gas in this country. It ought to be perfectly obvious to those responsible for the contents of daily newspapers (which claim to know the truth of most things) that gas companies, working under the sliding-scale and faced by the keenest competition from electricity, would not maintain the present prices a day longer than need compels. And need does compel in these days, and, in many cases, is likely to do so during the next two or three months.

Ignorance or mental sluggishness is at the bottom of the silly effort which was recently made by some newspapers to defame gas suppliers, and to antagonize the public against them. So far as we have been able to ascertain, what the newspapers have said regarding the matter does not represent public feeling; it is probable that the majority of the public are more practically minded than the newspapers concerned in the recent essay. Anyway, most men must be aware that a big industry using coal as a raw material, and consuming some 18 million tons a year, cannot meet, without huge expenses being incurred, such a shock as a seven months' absence of home-produced coal, provide in pre-stoppage times stocks for part of the period, purchase coal from any available foreign source, and (not having any definite knowledge as to when the strike would end), make provision through contracts for a reasonable time ahead, so that the people should not be destitute at any time of gaseous fuel and coke. In such circumstances, to administer providently and with much success is a matter for praise, and not for denouncement. It has apparently not crossed the minds of those responsible for the conduct of the newspapers concerned in the gas-price "stunt" that, had it not been for the gas industry, and what it has done, the country would not have been able to hold out against the revolutionaries as it did during the grave period between May 1 and Dec. 4. Obviously, too, while the whole country is waiting to absorb British coal, and people abroad who prefer certain varieties of the British product are anxious to get supplies, gas undertakings cannot perform miracles, or compel the delivery of British coal to them; nor can they break the protective contracts which they made for coal from abroad in the interests not only of their concerns, but of their consumers. The application of a little rational examination of the facts of the situation should have prevented the newspapers in question from fooling themselves and from attempting to fool the public. Seven months' stoppage of the coal industry must leave behind it many abnormalities which have to be cleared away before normality can be reached.

Enlightenment for the Press on these matters was supplied by the President of the National Gas Council at a luncheon yesterday week. He showed how gas undertakings had no more to guide them than other people as to the duration of the strike, and what a constant source of anxiety it has been to obtain the necessary supplies. Those undertakings which consume immense quantities of coal have had to operate in many countries in making contracts for coal in proportion to their obligations. If they have erred at all, it has been on the right side. That this is so, is proved by the fact that, a week or so ago, although the strike ended on Dec. 4, many gas undertakings had received little English coal, and some of them none at all. The Gas Light and Coke Company, with their big requirements, had then received only seven cargoes of coal, which is equal to two days' requirements! The President (as the Governor of the Company) put the pertinent questions: "Where should we have "been to-day, had we not purchased these hundreds of "thousand tons of foreign coal?" "Where should we "have been to-morrow, next week, at Christmastime, and "the New Year, if we had had no coals coming from all "over the world to help us through the next couple of "months?" Perhaps the newspapers which have been attacking the gas companies will attempt to answer the questions. Another factor is that—not knowing when the strike would terminate—to assure the supply of gas, contracts for American and German coal have had to be made two or three months before delivery. Delivery takes time; the American and German coalfields not being next door to the gas-works of this country. The coal so contracted for has to be received, and (with the heavy freights now ruling) paid for. Some remarkable figures were quoted by the President. The Gas Light and Coke Company have had to buy 1,600,000 tons of foreign coal; and

the cost has been something like £2,400,000 beyond what the Company would have had to pay in normal circumstances for British coal. In other words, the average excess cost has been 30s. per ton. Allowing a credit of £500,000 for the additional price received for coke, there remains a net debit balance of £1,900,000. The average of 30s. does not adequately reflect the struggle there has been for coal—a struggle represented by increases on normal prices ranging from 100 to 250 p.ct. Yet the advance of the price of gas by the Company is only about 20 p.ct.; and no increase was made while the stocks of British coal were being worked. The figures quoted by Mr. Milne Watson would have (subject to geographical situation) proportionate application to many undertakings of less magnitude. There are some concerns that have perhaps been more fortunate than others in their coal dealings; there are some that are charging much of their excess costs against reserves which will have to be built-up again as and when circumstances will allow. Generally speaking, the earlier there is a clean slate, the better.

No hope was held out by the President that any substantial reduction in the price of gas could be made until the increased expenditure on coal, less the enhanced value of coke, has been liquidated. But the public will remember what the gas industry has done for them during the great struggle. What would have happened if the industry had not been in a position to do this, is beyond conception. The British public, too, will appreciate that the purchase of, and contracting for, expensive coal has been for the safeguarding of their gas service. They will also understand that there can be no "profiteering" in gas with the sliding-scale in operation. Their sense of justice, we are convinced, will rise superior to the banal attacks of newspapers which seek popularity by methods that have no regard to facts, and therefore are contemptible.

## Centralized Control of Gas Production.

One of the interesting features of our gas organizations is the greater frequency with which chief engineers and managers now address, or give papers at, meetings of the Junior Associations. This recognition by the former of the work of the latter is stimulating to the members; and it also brings the juniors into more intimate contact with the thoughts, views, and aspirations of their professional seniors. This is all to the good. The members of the London and Southern Junior Gas Association were fortunate in having secured Mr. C. M. Croft, the Chief Engineer of the Wandsworth, Wimbledon, and Epsom District Gas Company, to read a paper to them last Friday. His subject was "Centralized Control of Gas Making at Wandsworth." On the works it is highly important that gas manufacture should be brought into such submission, by methods of control, that the calorific value and composition of the gas can be almost positively regulated. Not only is this valuable to the undertaking, but it relieves the gas engineer of much doubt and anxiety, and enables him to devote more attention to his other duties and the daily problems, besides which it is productive of manufacturing refinements and economies. The paper leaves no room for doubt as to what are Mr. Croft's views regarding the system of control he has adopted; and the realized results justify his good opinion. The paper, we are confident, will be widely studied.

To appreciate fully Mr. Croft's choice of a control system, it is necessary to read the paper, to ascertain the features of the manufacturing plant, which are of an order which, we should imagine, would put to the severest test any system of centralized control. Nevertheless, what was desired has been obtained. Mr. Croft adopted the vacuum control system, of which the "Arca" regulator is the central feature. In designing the vacuum control station, the principle was adopted that, with any type of retort-house control, quality should be regulated in conjunction with volume. That is an excellent ideal in these days of therm working and trading. Three small exhausters in the basement of the control station draw a sample stream of gas immediately it is made from the retort-houses. The outlets from the exhausters are connected to Carr-Nairne jet calorimeters, which are each provided with a small oxide purifier, capable of being promptly changed by the attendant. The advantage of this arrangement is that the calorific value of the gas from any of the retort-houses is observed within a few minutes after the gas has left the retorts, and the exhaust pull on any one house can thus be regulated by the "Arca" apparatus to maintain a constant calorific value. That is a valuable auxiliary to carbonizing operations. Verifying the working of the jet calorimeters is a recording water-flow calorimeter, which is connected to the main outlet of the station meters; and the average quality of the mixed gases from the retort-houses, after purification, is recorded. The charts show that by the system of control—here briefly described, but in detail in the paper—a level quality of gas can be obtained of the desired standard value. Any slight variation there may be in quality disappears by mixing in the gasholders. A standard Boys calorimeter is fixed in the control house for testing gas from the various parts of the works. Every provision, it is obvious, has been made to ensure the reliable working of the system. For example, the gas supply to each jet calorimeter and to the recording water-flow calorimeter can be turned on to the Boys calorimeter, so that each instrument can be calibrated and checked from time to time. Supply pipes from each gasholder outlet are also connected to the Boys calorimeter, so that the gas leaving any holder can be tested. As a routine practice, gas is also tested in the valve room as it is supplied to the district. Another point is that the carburetted gas is tested on the Boys instrument—its quality being maintained at the same level as that of the coal gas, so that there shall be no fluctuations of calorific value due to varying percentages of admixture, though it may be taken that the average does not exceed 15 p.ct. While the control station at present functions for the regulation of vacuum and quality, it is intended that the volume of the gas from each retort-house shall be measured; and—meter makers should note this—a type of meter suitable for this purpose is being sought. Mr. Croft and his staff are trying to make as complete a job as possible of the control system. They have another ideal; and it is to co-ordinate the calorimeters and the regulators so that they will be automatically corrective for quality. The consummation of this ambition means a delicate process. Though in this regard no success has yet been achieved, it is hoped that experiments will eventually result in attainment.

Practical considerations affecting the maintenance of constant standard value from each retort-house during the twenty-four hours are offered in the paper. It is found that more therms per ton are obtained than when the quality is sometimes above and sometimes below the standard, though giving an average equal to the standard calorific power. It is Mr. Croft's experience, as it is that of other gas engineers, that variations in calorific value are accompanied by other undesirable effects. For example, the percentage of inerts is usually larger than with level calorific working. Furthermore, variations in quality mean undue differences in the volume and the rate of passage of the gas through the purifying plant; and what has also to be guarded against, in the interests of the consumers, are the variations caused by divergences in quality at the points of combustion. There is a big and far-reaching advantage in realizing practically standard gas at the source of production. As will be seen in the latter part of the paper, since the vacuum control house became a participant in the operations at Wandsworth, the gas has been more constant in quality and composition, as regards both calorific value and inert constituents. It has enabled closer working to the declared calorific value of 470 B.Th.U. Most marked, too, has been the effect in increased make per mouthpiece. Another important matter is that at no point is undue pressure present in any retort, and the deposition of retort carbon or scurf has been considerably reduced—in fact, it has reached what Mr. Croft considers to be the minimum. This is a combination of benefit which cannot be lightly disregarded.

The contribution by Mr. Croft to the subject of the value of control in gas manufacture is of that practical and convincing order which, we are sure, will receive consideration, and produce good effects, in other quarters of the industry.

## Where are the Students?

IN publishing articles and correspondence on this subject, we have, of course, only one object in view. It is the future welfare of the gas industry, holding, as we do, strong convictions regarding the qualifications which will be required in the time ahead by men in all parts of the industry. We learn from a letter in our "Correspondence" columns to-day, sent by the Organizing Secretary of the Institution Education Scheme (Mr. Walter Hole), that the matter upon which comment has been made has been under review by the members of the Advisory Committee. It should be said at once that there is no question that the lack of encouragement to technical educational institutions to inaugurate courses for gas students is in any way attributable to those responsible for the formulation and conduct of the scheme itself. They have done their part—and well; and they are always open to consider any amendments in the details and conditions of the scheme which, while not degrading standards, will enhance its value to the industry. The result of the consideration of the subject by the Advisory Committee was a unanimous decision to call, for Wednesday, March 9, a conference of representatives of the Junior Gas Associations of England, Scotland, and Wales, to discuss the various points raised in our columns and in correspondence, as well as other matters associated with the working of the Education Scheme—particularly as they affect the free inflow of students. The details of the conference, Mr. Hole tells us, will be a matter for future determination. He also explains that the reason for the fixture being so far ahead as March next is in order to allow of the results of inquiries which are now proceeding being received and considered prior to the meeting. There can be no doubt that considerable good will result from this conference of representatives of the Junior Associations; but, so far as we have been able to ascertain, it is not the juniors who require to be tackled so much as those who are responsible for the administration of gas undertakings. What is wanted is: First, encouragement from them to the juniors to enter upon the fundamental technical training; and, secondly, facilities for attending the necessary courses. We have found, in the course of our investigations, that there is a reluctance on the part of juniors to speak out on this subject. This we can well understand, as no junior—not even in the interests of the cultivation of his ability for the purpose of ensuring his own future success and that of the undertaking he serves—would care publicly to say anything regarding the passive attitude of his superiors in regard to the points of encouragement and facilities. To our mind, the senior district organizations are the ones that should seriously consider and discuss this matter. We earnestly submit that its importance would justify their best endeavours.

## A Warning from Germany.

THERE are several suggestive points in the communication which we published last week (p. 690) from the pen of Herr Ernst Korting, of Berlin—a gas engineer whose distinguished professional work is as much recognized in this country as it is in Germany. The close observation that he keeps on all matters affecting the gas industry results in a perception of possibilities and developments of which it is valuable to make note. The real object of his letter is to make an appeal to the Durham colliery owners to supply gas coal to Germany (Herr Korting has a partiality for the Durham product) containing less ash, and at a price which will make it acceptable in competition with German material. He emphasizes the ash question by stating that they have found in Berlin no less than 11·1, 11·8, and 12·8 p.ct. of ash (quoting only a few instances) in three well-known Durham gas coals, whereas he finds in a Silesian coking coal 4·6 p.ct., Silesian gas coal 7 to 8 p.ct., and Ruhr coal 8 to 10 p.ct.—advantages which are not easily counterbalanced by the good quality of the gas coke from Durham coal (hard and large).

There is another outstanding point in the communication. It is the menace which he detects to gas engineering in the development which is taking place in Germany through the activities of the coke-oven interests, which are bound up with the coal industry; and trading in coal is under the direction of the large Coke Selling Syndicate. It is easy to see how the interrelations between this controlling coal-trading organization (the members of which are also the owners of the coking plants) could, if they can successfully develop their operations, influence in the downward direction the art and practice of gas engineering as now established. Herr Korting tells us that the strong and powerful organizations connected with the Ruhr coal and the iron industries have conceived the gigantic idea of laying high-pressure gas-mains all over the country, and of offering coke-oven gas at a price decidedly lower than the cost of production by local gas-works; thus leaving the monopoly of the supply of both gas and coke to the Ruhr Syndicate. Some 63 p.ct. of the members of the Syndicate have agreed to a scheme for laying the necessary mains for collecting the gas from the coke-ovens.

In Germany the chief household fuel is coke; and for central heating and single heating stoves metallurgical coke is just as good as, if not better than, gas coke. No less than 7 million tons of coke per annum are required by German householders. The coke-oven people see that it is a paying proposition to offer at the outset gas at a very low price, in order to get rid of so formidable a competitor as cheap gas coke. Propaganda in this direction is being carried on; and there are some gas engineers in Germany who appear willing to drop from their present status as carbonizing engineers to mere distributors of the gas produced by coke-ovens. A danger in this is that, if there is success in this direction, when the initial stages have passed and the gas-works plant has become obsolete, it would be easy to increase the price of the gas from the coking plants—to the detriment of consumers of gas in the districts receiving such supplies. Herr Korting's view is that the most effective weapon at the disposal of the gas engineer with which to parry the threatening blow is the ability to prove that his own production delivered into the holder does not cost more than coke-oven gas. To enable this to be done, a moderate price and high quality of coal are main essentials. That is Herr Korting's object in advising Durham coal owners to preserve the German market if at all possible.

### Coal Contracts.

The National Gas Council have decided to draw up a model form of coal contract, for the information of those undertakings which desire assistance in the matter.

### Trade Unions and Politics.

By 13,986 against 2382 votes, the National Union of Seamen have declared, on a ballot, against political affiliations. The Union is now entirely non-political, and severs its long association with the Labour Party.

### Maintenance Conference.

The Joint Conference which is being organized by the Institution of Gas Engineers and the "B.C.G.A." on the subject of "The Inspection and Maintenance of Consumers' Fittings and Appliances," will be held (by the permission of the Council) at the Institution of Mechanical Engineers, Storey's Gate, S.W.1, on Wednesday, Feb. 16.

### Coal Output.

It is officially stated that in the week ended Dec. 4 the output of coal from British mines was 3,226,100 tons, compared with 2,324,000 tons in the previous week. The number of men at work during the Dec. 4 week was 730,100. It is interesting to note that, in the quarter ended December, 1925, there were 1,041,997 employees at the mines; and the average weekly rate of production for the quarter was 4,820,000 tons.

### Gas-Piping and Housing Bill.

It is learned from the minutes of the National Gas Council that, as a result of an interview with an official of the Ministry of Health, a communication has been received, which states that the Ministry are satisfied that the Housing (Rural Wor-

kers) Bill covers the provision of gas-piping in the works authorized by it. An assurance has also been given in writing to the Council that the Ministry will so notify local authorities in a Memorandum when the Bill becomes law.

### Prorogation of Parliament.

Parliament was prorogued last Wednesday; and the next session will open on Feb. 8. In the King's Speech on the prorogation, he reminded the members of both Houses that, when addressing them at the commencement of the session, he expressed the earnest hope that the report of the Royal Commission on the economic condition of the coal industry would, with the willing co-operation of all concerned, pave the way to a peaceful solution of this great social and economic problem. He added: "This hope was not fulfilled. It remains to us now to unite in effacing all bitter memories of the past, and to set our eyes steadfastly upon the future, inspired by a common impulse towards genuine fellowship and sustained endeavour, upon which alone the prosperity and happiness of my people can be firmly based." One other clause in the speech was this: "By the passing of the Electricity (Supply) Bill an important and overdue step has been taken towards extending the provision of electrical energy throughout Great Britain."

### Boosting Gas Lighting.

The interesting letter from Mr. A. C. Pullen, Secretary of the Colombo Gas and Water Company, Ltd., which appeared in the last issue of the "Journal" (p. 716), is a testimony to what can be accomplished in making progress with the business of gas lighting under the most severe conditions of climate and acute competition from electricity. The letter was suggested by the paper on "Gas Lighting" which the Chairman of the Council of the Society of British Gas Industries (Mr. F. J. Gould) read at the last meeting. Mr. Pullen compliments the Manager of the Colombo Company (Mr. Barker Johnson) for what he has done in this regard. His success has not been gained by sitting still, but by persistent effort, while not neglecting the cooking, heating, and other loads. As confirmation of success, we have the statement that for the year 1925 the quantity of gas sold for lighting was 45 p.ct. more than it was five years previously, and the letter shows that work is in hand which will further enlarge the demand for both public and private purposes. We agree with Mr. Pullen that more serious work and demonstration in this country would go far to hold and extend the business in gas for lighting.

## PERSONAL.

Dr. C. C. Carpenter, C.B.E., M.Inst.C.E., has been elected a Director of the Commercial Gas Company, in place of the Hon. Kenneth Mackay, who has resigned.

In recognition of his 41 years as Gas Manager in Dunoon, Mr. David Robertson, who recently retired, was last week entertained by the Town Council and friends at a complimentary dinner in M'Coll's Hotel, when he received a silver tea service.

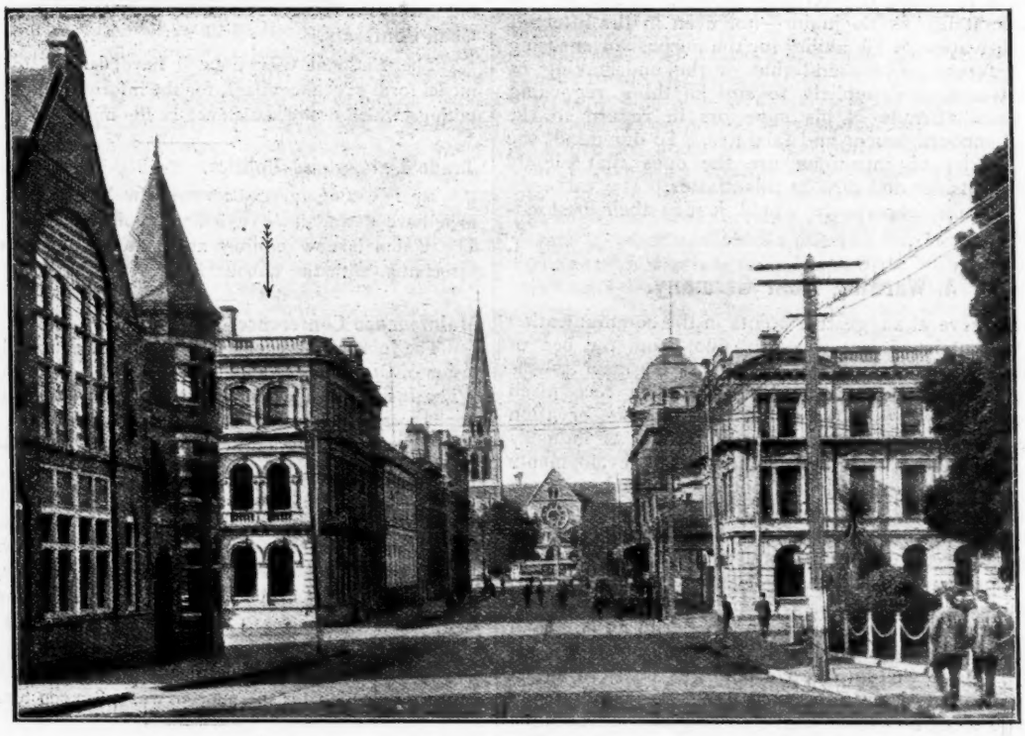
Mr. Harold Greig, Chief Chemist to the Sunderland Gas Company, was successful at the November examination in obtaining the degree of B.Sc. of the University of London.

Mr. F. A. Pykett, Distribution Superintendent to the Lancaster Corporation Gas Department, has resigned, having accepted a similar post under the Coventry Corporation.

Mr. W. J. Baker, Chief Assistant at the works of the Isle of Thanet Gas Light and Coke Company, Margate, has been appointed Assistant Engineer to the Shanghai Gas Company, and sails in the "Mongolia" on the 14th prox. Mr. Baker was articled to Mr. S. O. Stephenson, of Worthing, and received his technical education at Brighton. During the war he served with the Royal Air Force.

Mr. C. H. Bowers, of Tunstall, has been placed on the Commission of the Peace for Stoke-on-Trent. He is a member of the Town Council, and was formerly Chairman of the Gas Committee, in which position he took a keen interest in the initiation of the scheme, now in progress for the centralization of gas manufacture at Etruria.

## THE GAS OFFICES OF CHRISTCHURCH (N.Z.).



We have received from the Christchurch (N.Z.) Gas, Coal, and Coke Company, Ltd., a copy of the "Star" Christmas Annual. It is a book of unusually well-prepared photographic views in Christchurch—the "Garden City" of New Zealand. One of the photographs is of Worcester Street West, looking East, and the second building on the left-hand side—the one over which an arrow has been put—is the offices of the Company. It shows that away in far New Zealand this Company takes its place in the business world with a central habitation for its activities which is a credit to the city and to the concern itself. The building impresses one with the dignity of position and the importance of gas service.

# ELECTRICITY SUPPLY MEMORANDA.

**Derelict House Wires and Electricity.**

An interesting case of the danger of allowing derelict wires to remain in houses where electricity is employed has been brought to notice; and the experience will act as a warning against such conditions being permitted in any case in future. In using the information, we are asked not to mention names; but this will not depreciate the value of the illustration of something to be avoided. In an old dwelling two gas fires were installed in June last—one in a bedroom on the first floor. The house is electrically lighted. The rooms were at one time fitted with copper wire bell pulls; and though these are no longer used, the wires remained in their original position beneath the floors. These derelict wires played a part in the trouble which we are about to describe. On Nov. 29, the occupant of the front bedroom in which one of the gas fires was fitted observed smoke issuing from beneath the floor near the fire place. On the flooring boards being taken up, it was discovered that the lead pipe supplying the gas-fire was blazing furiously. The gas supply was immediately cut off, the fire extinguished, and all danger averted. Examination of the fittings beneath the floor showed that the lead pipe passed under the steel casing containing the electric wires; but with a space of 3 in. between. It also passed over the derelict bell wires; but originally, it is believed, not in contact with them. The bell wires, however, passed alongside the electric steel casing, and were in contact with it at several points. The electric system developed a fault; and the bell wires became live electric wires. When in this condition, the wires, either through warping when heated or through actual contact, formed an arc, and pierced the gas-fire piping—allowing gas to escape, and igniting it. The gas pipe shows two large holes on the underside (one 1 in. by ½ in, the other ⅜ in. by ¼ in.), and two small apertures on the upper side—one above each of the large holes. It appears from this that contact was made between the gas-pipe and the bell wires at more than one point. Possibly the contact was intermittent, as the wires moved about during the process of warping. The old bell wires have now been removed, as far as is practicable in an old house. The fire occurred in the morning. Had it happened later, when no one was in the bedroom, or during the night, the result might have been disastrous.

**Misbehaviour.**

Electricity supplies have been misbehaving themselves again. In the City on Dec. 10, it demonstrated (as it has frequently done in various places before) how a little accident can bring about widespread inconvenience. A workman at the Bankside Station driving a steel spike into a wall succeeded in sending it through a vital cable. Several circuits were affected; and in many offices in the City the humble candle had to do duty until there could be restoration of the supply. During a dense fog in Paris the same day, there was a total stoppage at one of the power stations. Business was brought practically to a standstill, excepting where candles sufficed. Great precautions were taken at the banks to prevent any unauthorized appropriation of cash. Where gas was not in use, Huddersfield was in darkness for about fifty minutes last Thursday week. Previously—on Nov. 28—there had been a failure; and the normal service was not restored before the 30th. The Electricity Commissioners are blamed. Some two-and-a-half years ago sanction was sought for an extension of the plant; but the Commissioners refused this, in view of their own plans for development, and the prospect of Government legislation. Then the coal dispute and poor coal have handicapped the station, and have caused the plant to be run at full pressure. At Gravesend, the coal strike is charged with having delayed the completion of a sub-station; and this, with the inferior quality of coal, has made the situation very difficult for the Electricity Department. Those are the attributed causes of the sudden failures of the electricity supply—not on one occasion, but several. On the last Sunday in November, electricity declined for about half-an-hour to illuminate the churches; on the following Tuesday evening, where gas was non-existent, there was darkness for about two hours. Shopkeepers suffered seriously; and exemption was not granted even to the hospital by the erratic current. An operation had just been completed when the lights failed; but the hospital authorities learnt a lesson some time ago when the electric lamps in the operating room ceased to function during the amputation of a patient's leg; and a dependable gas lamp is now kept ready over the operating table. It is interesting to note that the Electricity Committee hold their meetings in the morning; and some of the facetious members are inclined to think this is preferable to evening sittings! Councillor Pryke is of opinion that it would be courteous on the part of electric energy if it would give users some warning when it proposes to "go out," so that they could get in a stock of candles to tide them over its absence. A failure occurred in the North-end district of Liverpool shortly after five o'clock last Monday week, and caused some inconvenience on business premises, and a delay of the tram service for about half-an-hour. Many of the shops with gas installed were able to carry on business; but at other places, including the Northern District Post Office, at the bottom of Everton Valley, there was no such alternative. The postal staff had recourse to candles, which proved a poor substitute. For a time the area was in partial gloom, with long strings of darkened tramcars lining the middle of the streets. Power and light were re-established intermittently until finally, just before six o'clock, conditions were normally restored. On Dec. 10, travellers on the City and South London Railway were delayed for some time, owing to a defective motor on one of the trains, which was compelled to proceed at reduced speed, and so affected that of the succeeding trains.

**Toy Electric Trains and Gas Pipes.**

The Home Office has thought fit to issue the following warning: "The attention of the Home Secretary has been called to the fact that electric toy railways, which are designed to be worked off the ordinary domestic supply of current, and might in certain circumstances give serious injury by shock, are being placed in considerable numbers upon the Christmas market. He is advised that the use of these railways on the bare ground or near any earthed metal—*e.g.*, water-pipe, radiators, gas-pipes, or stoves—would, in particular, be dangerous. The possible danger of these railways should be realized by parents and others having the charge of children."

**Dual Lighting in Places of Entertainment.**

The Theatres and Music Halls Committee of the London County Council are perturbed over the effect that the unification of electricity supply in London will have upon the provision, for the protection of the public, of dual systems of lighting in places of entertainment. This need for dual systems arose when inconstant electricity was introduced; and experience has proved the value of the regulation. The Council and the Lord Chamberlain ordain that in all places of entertainment in London, while the public are on the premises, the lighting shall be on two systems—two independent electric, electric and gas, electric and oil or candles, and gas and oil or candles. In some premises the obligation has been met by the provision of two independent systems of electricity. But if the technical scheme for the supply of London and the Home Counties be developed, the independent supplies of electricity will no longer exist. The Committee attach importance to the retention of a dual system of lighting; but, of course, they do not suggest that the unification of electricity in London should be subordinated to such a consideration. They have, therefore, proposed to the Council that a communication should be directed to the various Associations representing the licencees calling their attention to the effect of the unification scheme upon the requirement of dual lighting systems in places of entertainment. The management of these places can easily comply by installing gas lighting.

**Small Householders and Electricity Payments.**

In some way or other, small householders must be assisted with the introduction of electrical installations, if the undertakings require their custom, which cannot be of a really profitable order. The general plan is that of the gas industry—an addition being made to the price of the unit through prepayment meters. This type of meter for electricity is expensive, and is rather prone to derangement. In connection with the housing scheme at West Hartlepool, a new system has been introduced of collecting a fixed charge of 1s. per week with the rent, and charging for all electricity consumed at 1d. per unit. The "Electrician" states that, the weekly rent of 1s. being more than sufficient to cover the standing charges, a bowl fire and an iron are supplied to each consumer, which helps to increase the consumption. While last November there were only 20 consumers on the housing estates who were paying more than 52s. per annum for electricity, there are now 292 paying a fixed charge of that amount and 1d. per unit consumed in addition. The Electrical Engineer hopes he will get the remainder of the 550 consumers on the estates to change from slot meters to the domestic rate.

**Exported Electricity.**

From the Department of Trade and Commerce, Ottawa, Canada, we have received the annual report of the Weights and Measures, Electricity, and Gas Inspection Services for the year ended March 31 last. One item informs us that, by Section 10 of the Electricity and Fluid Exportation Act, 1907, the Governor in Council has power to impose a duty on all electricity exported from Canada. An Order in Council was accordingly passed, which imposed an export duty of 3-100ths of 1 p.ct. per KW.-H. upon all electrical energy exported from April 1, 1925. The export duty collected was $288,392·41, and the license fees $600. Deducting expenses

($263·11), there remained $288,729·30. There is thus some revenue for the Canadian Treasury from the export of electricity. The electricity produced for use in Canada last fiscal year was 3,575,289,701 KW.-H., as compared with 3,127,395,093 KW.-H. for the preceding year. The production of electricity for export was 1,359,343,735 KW.-H., as compared with 1,239,071,297 KW.-H. in the preceding year.

**Progress in 1925-26.**

Had the Electricity Commissioners issued their report for the year ending March last before the Government Electricity Bill had been passed by the two Houses of Parliament, some of our politicians might have thought that, with the electricity industry doing so well as is now statistically represented, it would be better to leave well alone, and to put aside the Government proposals. The Commissioners report that in the year there was a substantial increase in the provision for meeting the demands for electricity; that there was an increase of 9·5 p.ct. in the units generated; that, notwithstanding the absence of normal conditions of trade, the production of electricity has increased by nearly 60 p.ct. since 1920-21; and that the additional output has been accompanied by progressive economy in the average consumption of fuel per unit generated. During the year charges, too, were very generally lowered. On the basis of a population of 44 millions, the electricity sold by authorized undertakings—5,515,345,364 units—represents an average consumption of 125 units per head, against 117 the year before. But these figures do not take into account the supplies used for traction purposes, and generated at railway and tramway stations, or of the further large supplies generated privately at industrial and commercial stations. The development in units sold is shown by the following:

| Year. | Units Sold. | Percentage Increase on 1922 Figures. |
|---|---|---|
| 1922 | 3,645,190,732 | .. |
| 1923 | 4,338,850,926 | 19·0 |
| 1924 | 4,997,963,253 | 37·1 |
| 1925 | 5,515 345,364 | 51·3 |

During the same period, as we have shown from the Board of Trade Returns, the gas industry had a magnificent increase, and the coal used showed an excellent reduction in relation to production. During the year, at the 584 stations included in the statistics, a total of 8,122,961,823 units were generated; which required the consumption of 8,263,880 tons of coal, 142,876 tons of coke, and 38,810 tons of oil fuel. If, for a rough estimate, we reckon the tonnage of oil should be doubled to convert it to its equivalent in coal, then the total fuel used was 8,484,376 tons; and the energy generated equal to 957 units per ton, giving a consumption of 2·34 lbs. per unit. It is also of interest to note that the difference between the units generated and sold is about 32 p.ct., which, we take it, includes the energy consumed by the undertakings themselves and the losses in distribution. The figure suggests that the losses were something more than negligible. The data also show that actual sale was only about 650 units per ton of coal.

## NATIONAL GAS COUNCIL.

A meeting of the Central Executive Board of the National Gas Council took place on Dec. 14 at the new showrooms of the Gas Light and Coke Company, in Church Street, Kensington, at the invitation of the Governor and Directors of that Company. The chair was taken by Mr. D. MILNE WATSON (President).

### THE LATE MR. S. Y. SHOUBRIDGE.

The Chairman referred sympathetically to the loss which the gas industry had sustained in the death of Mr. S. Y. Shoubridge, for several years Hon. Secretary to the Institution of Gas Engineers, and Engineer to the South Suburban Gas Company. A vote of sympathy with his relatives was passed.

### MEMBERSHIP OF BOARD.

It was reported that Sir Russell Bencraft, by virtue of his Presidency of the British Commercial Gas Association, became a Vice-President of the Council and a member of the Central Executive Board, in place of Mr. J. E. Cowen. Sir Russell had, however, suggested that, as he had been unwell and was unable to attend to business, Mr. J. R. H. Jacobs should deputize for him at meetings of the Board for the time being.

### COAL POSITION.

Interviews were reported between officers of the Council and the Board of Trade with regard to undertakings whose statutory enactments did not enable the Board of Trade to authorize an increase in their standard or maximum price, and also with regard to undertakings working under the Burghs (Scotland) Gas Supply Act, 1876. In regard to undertakings supplying gas under this Act, it was pointed out that, inasmuch as a period of six months had elapsed since the commencement of the coal stoppage, such undertakings had, under the provisions of the Act, had an opportunity of revising their prices.

### DEPUTATION TO THE MINES DEPARTMENT.

A meeting of the Emergency Committee of the Central Executive Board on Nov. 22 was reported, and a subsequent interview with Col. Lane-Fox to discuss the position in which gas undertakings would find themselves when the embargo on the export of coal was removed and the Emergency Regulations relating to gas manufacture ceased to operate.

### COAL CONTRACTS.

It was decided to draw-up a model form of contract for the information of those undertakings who desire assistance.

### ELECTRICITY (SUPPLY) BILL.

It was reported that this Bill received second reading in the Lords on Nov. 23, when the motion moved by Lord Carson and Lord Gainford to refer the Bill to a Select Committee was defeated. An amendment which seemed materially to affect the industry was one in the name of Lord Montagu of Beaulieu, which sought to give the Electricity Commissioners power to determine the places in which transformers and secondary lines should be placed. The Council immediately made representations to the Ministry of Transport; and the amendment was withdrawn. An amendment was also secured to an amendment moved by the Earl of Malmesbury and Lord Strachie for the protection of county bridges.

### SMOKE ABATEMENT BILL.

It was reported that the Council had carefully watched this Bill through its various stages, and had supported the endeavours of the Coal Smoke Abatement Society to insert an amendment for the purpose of enabling urban authorities to make by-laws regulating the smoke nuisance in the case of new domestic premises. The amendment, however, was negatived, but minor improvements had been effected in the Bill.

### HOUSING (RURAL WORKERS) BILL.

It was reported that representatives of the Council had interviewed an official of the Ministry of Health, and suggested that the provision of gas piping might be included in the works authorized in the Bill. The Ministry of Health were satisfied that the Bill, as drafted, covered the provision of gas piping, and had given an assurance in writing to the Council that they would so notify local authorities in a covering Memorandum when the Bill became law.

### TAR.

(*a*) *Constitution of the British Road Tar Association.*—It was reported that the National Association of Coke and Bye-Product Plant Owners had not yet signified their approval of the draft constitution, but it appeared from a meeting held in Manchester last month that their approval was likely to be received at an early date. It was decided to authorize the Joint Committee to continue its work until the end of January, in anticipation of the Coke Oven Owners' decision to join the Association being received by that date.

(*b*) *Tar Conference at Manchester.*—Mr. H. C. Head (Chairman of the Joint Committee) reported a successful tar conference at Manchester on Nov. 26, when the question of tar for roads received much attention. Among the papers was an interesting one by Mr. W. Gordon Adam, dealing with tar from the point of view of the highway authority. Members attending the conference had been invited to visit the National Coal Products, Chemical, and Engineering Exhibition, at which the British Road Tar Association had a stand, where samples of graded road metal, tarred and untarred, as well as sections taken from actual tarmacadam roads, were exhibited.

(*c*) *Draft Specification of Tar for Road-Surfacing.*—It was reported that, as the result of certain communications which had been received from members of the Council, the Joint Committee had made some modifications in the new draft specification. It was decided that, after further consideration by the Joint Tar Committee, the specification as revised should be circulated to members of the Board in sufficient time to obtain their views in regard thereto at their next meeting on Jan. 11.

### INSURANCE.

It was reported that a proposal had been submitted for a single policy, especially drafted to cover all risks against which

gas undertakings might wish to insure. This was referred to the several districts, for their consideration. A suggestion was made that the policy should be extended to include claims arising from damage by privately-owned railway wagons.

BRITISH ENGINEERING STANDARDS ASSOCIATION.

A communication, dated Nov. 30, from the British Engineering Standards Association was reported, to the effect that, arising out of the tests on cast-iron pipes recently carried out at the National Physical Laboratory, the Sub-Committee on Cast-Iron Pipes at a recent meeting had decided to appoint a small Panel to consider the revision of the present British standard sockets, with a view to reducing the weight; and it was desired to have the assistance of a representative of the National Gas Council upon it. It was resolved that Mr. Hewett, of the Birmingham Corporation Gas Department, should be nominated to represent the National Gas Council upon that Panel.

## GAS REFEREES' NOTIFICATION.

### A Re-Issue.

There was last week a re-issue, under the Gas Regulation Act, 1920, of the General Notification of the Gas Referees—Prof. C. V. Boys, Mr. W. J. A. Butterfield, and Dr. J. S. Haldane—and copies of it are obtainable, at the price of 1s. 3d. net, from H.M. Stationery Office (Adastral House, Kingsway, London, W.C., and Branches). As from Jan. 1, 1927, previous issues of, and supplements to, the General Notification will cease to be current for any undertakers for whom Special Prescriptions incorporating the General Notification have been issued; and such previous issues shall be superseded as from that date by the present re-issue, except that returns and reports for the quarter ending the 31st inst. shall be made and applied in accordance with the Special Prescriptions and Notification current for that quarter. The re-issue of the General Notification will apply to each of those undertakers in addition to, and except as varied by, the Special Prescription; and where there is any provision in it inconsistent with the Special Prescription for any undertakers, the provision of that Special Prescription shall be substituted for that of the General Notification.

TESTING FOR CALORIFIC VALUE.—THE BOYS "BOX" CALORIMETER.

As previously, the apparatus to be used for ascertaining the calorific value of the gas supplied by undertakers who have sold in the preceding year not more than 100 million c.ft. of gas shall be the Boys non-recording calorimeter, with accessories, as described in the second appendix to the Notification. The Boys "Box" non-recording calorimeter, as described in the third appendix, shall, however, be used instead of the ordinary Boys calorimeter in all testing places for which it has been sanctioned by the Gas Referees. Full instructions, which must be followed, for the use of the "Box" calorimeter are included in the Notification.

AVERAGE FOR THE QUARTER.

Dealing with quarterly averages of calorific value, the Referees say: "It should be borne in mind that if, in any quarter, the average calorific value of the gas supplied by any undertakers, ascertained in the manner described, is less (in any degree) than the declared calorific value, action by the Chief Gas Examiner under section 9 (4) of the Gas Regulation Act cannot be prevented by reason of the smallness of the deficiency. No margin is given under that sub-section of the Act."

RESULTS OF TESTS.

Under the heading of "Times and Forms of Gas Examiners' Reports," the Referees have added: "The gas examiner shall, on leaving the testing place, inform the undertakers in any way indicated by them, which does not involve serious trouble to him, of the results of the testings made by him on that occasion. For instance, where the testing place is on their premises, he may himself deliver his report or an informal note of the results, or where a testing place is elsewhere he may post or leave the report or informal note at any convenient place indicated to him by the undertakers. Such informal communication of the results of testings to the undertakers is especially called for where results would not otherwise reach them promptly."

APPEALS.

The rules with regard to appeal procedure are set out in an appendix to the Notification; and it is pointed out that appellants under section 6 (1) of the Gas Regulation Act are required by Rules 3 and 4 to send to the Gas Referees a copy of their notice of appeal and a copy of the concise statement of the facts and contentions on which they rely.

BOYS BELL METER.

Appendix D includes a description of the bell meter which has been designed by Prof. Boys, and "shall be provided for use as an alternative or substitute for the ordinary experimental meter in all testing places for which it is approved or specified by the Gas Referees." The Boys bell meter differs in construction from the usual form of wet test meter in having the measuring drum placed within a bowl covered with a glass bell, so that the working of the drum is visible to the user, and in having the axle of the drum running in bearings in the water of the meter, so that stuffing-box friction and need for lubrication do not exist. Further, as the water level is above the junction between the glass bell and the bowl, leakage of gas is impossible. The water level is determined by the use of a submerged point visible through the bell; it being so adjusted that the point, disturbing the light reflected from the water, appears and disappears during the working of the meter. The drum, made preferably of transparent celluloid, is provided with a central buoyancy chamber which carries part of its weight, but which serves the more important purpose of limiting the area of the water floor of each compartment at the critical moment at which gas is trapped within it, so that any very small change of water level shall have as small an effect as possible on the gas capacity.

Owing to the small friction, the accuracy with which the water level may bet set, and the small area of water floor in the measuring compartment, three factors are combined, each of which leads towards accuracy.

Full directions are given for the use of this meter.

The final appendix furnishes a list of recent official publications relating to gas supply.

## INSTITUTION OF CHEMICAL ENGINEERS.

From Prof. J. W. Hinchley, the Hon. Secretary of the Institution, we have received the following list of those elected to membership, &c., on Dec. 8.

*Full Member.*

JOHN WATSON NAPIER, Gas Engineer and Manager to the Alloa Town Council.

*Associate-Member.*

LOUIS SAXBY COMMON, General and Works Manager of Fabricas de Aceite San Jacinto, Ltd., Lima, Peru.

*Graduates.*

RONALD MAYNE COLLES, A.R.C.Sc., Student at the Imperial College of Science and Technology.

NORMAN ROY HOOD, B.Sc., Student at the Liverpool University, for Ph.D. degree.

*Students*

WILLIAM EDWARD REES EVANS, Pupil with British Portland Cement Manufacturers, Ltd., Penarth, South Wales.

BRIAN JEFFRIES POOLEY, Student Assistant, Manchester College of Technology and Messrs. J. Crosfield & Sons, Ltd.

## FORTHCOMING ENGAGEMENTS.

[*Secretaries of Gas and Kindred Organizations are asked to assist in making this diary of events as complete and useful as possible by sending the earliest intimation of all meetings.*]

**Jan. 7.**—INSTITUTION OF MECHANICAL ENGINEERS.—Informal meeting, to discuss "Developments in the Carbonization of Coal," to be introduced by Dr. C. H. Lander, 7 p.m.

**Jan. 11.**—NATIONAL GAS COUNCIL.—Meeting.

**Jan. 11.**—FEDERATION OF GAS EMPLOYERS.—Meeting.

**Feb. 16.**—INSTITUTION OF GAS ENGINEERS AND BRITISH COMMERCIAL GAS ASSOCIATION.—Joint Conference on "The Inspection and Maintenance of Consumers' Appliances," at the Institution of Mechanical Engineers, Storey's Gate, S.W.1.

**March 9.**—JUNIOR GAS ASSOCIATIONS.—Education Conference.

**March 16.**—BRITISH COMMERCIAL GAS ASSOCIATION.—Midlands District Conference at Smethwick.

INSTITUTION OF GAS ENGINEERS.

**Jan. 10.**—Emergency and Finance Committees.

**Jan. 11.**—Advisory Committee on Education.

# WATERLESS HOLDERS IN AMERICA.

The case for the waterless holder, from his Company's point of view, was summed-up in the following terms by Mr. J. J. O'Keeffe (General Superintendent of Manufacture to the Public Service Electric and Gas Company of Newark, New Jersey), in a paper which he contributed to the Technical Section at the last convention of the American Gas Association: "Assuming that there is supervision commensurate with the capital investment represented, we consider this type of holder, as designed and built in this country, to be an advance in the art of holder building, and free from the defects causing the Posen accident. The regrettable accident to this holder has been proved conclusively to have been due to poor design and worse construction, brought about largely by war conditions existing at the time, and furthered by incompetent handling. The very fact that twenty-eight holders, representing a storage capacity of 177 million c.ft., and a capital investment of over $12,500,000, have been erected or contracted for in this country since 1924 (20 million of which was contracted for after the Posen explosion), proves conclusively that the design and construction is fundamentally sound, or else the American gas engineer—admittedly a most conservative gentleman—stands convicted of a great error of judgment."

## EXPERIENCES.

At the time when he read the paper, his Company had three holders of this type actually in operation, while a fourth was practically completed. The determining factors in the selection of the waterless design of holder were, primarily, economy of ground space, lower cost of foundation and holder, the elimination of heating, and the removal of the snow hazard. Two of the four are outlying holders, in remote locations where the absence of snow and heating problems was particularly desirable. Among the other advantages of this holder, he said, are the diminished danger of corrosion, lessened cost of maintenance—especially as to painting—and the easy access to the moving parts for inspection and repair. Its action as an efficient condenser is also of marked advantage when it is used as a works holder. The greater portion of the condensable vapours is thrown down and retained in the plant, rather than delivered into the distributing system where its removal must entail considerable expense.

The first of the four holders referred to—a 500,000 c.ft. one at Somerville, New Jersey—went through the entire winter of 1925-26 without any heating whatever, and with only two occurrences that gave any concern. With the arrival of cold weather, there was a decided stiffening of the tar in the seal. Investigation proved that this was due primarily to the absorption of the lighter oils from the coal tar with which the holder was originally sealed. This condition was readily explained by the fact that the gas delivered into the holder was exceptionally dry, having passed through at least two compressions to 50 lbs., and been transmitted through approximately 90 miles of mains. Immediate steps were taken to correct this condition by the addition of sufficient water gas tar to lower the viscosity of the sealing medium to a point where it would flow more freely past the piston rubbing bar; and after that no further difficulty from this source was experienced.

The other occurrence was due to moisture. During a storm, rain was blown into the holder through the vents in the eaves. Some of this entered the cup, and formed a thin film of water on top of the tar, which froze to the sides of the holder when the piston was in a stationary position—a frequent occurrence in off-peak hours—forming a ridge or bead of ice over which the rubbing bar of the piston would have to pass on rising, with consequent risk of loss of seal. This ice bead was scraped off, together with the ice film on the cup. Careful inspection and immediate removal of water after subsequent storms, prevented a recurrence of this trouble.

## A 15 MILLION C.FT. EXAMPLE.

A little over a year ago, Mr. O'Keeffe's Company began the construction, at Harrison, New Jersey, of the largest waterless holder that had ever been projected. The holder went into service in the early part of this year, prior to which time the builders had encountered some difficulties from freezing in connection with certain small holders which had been completed during the erection of this larger one. These difficulties had not been anticipated, because experience had been with coal gas from which the condensation was very little. Taking advantage of the knowledge gained, the author's Company kept the moisture content down to a safe minimum by the removal daily of some 500 to 700 gallons of tar and water from the tar dam, replacing this with an equal amount of dry tar. The tar and water was removed from over the entire tar dam—approximately 800 lineal feet—through the single skimmer connection provided. This probably accounts for the large quantity of material removed, as effective skimming cannot be accomplished over such a distance where no gradient exists. The small amount of water found floating on the surface of the tar cup was removed through skimmer pipes, and passed down into the interior of the holder.

No other troubles were experienced, which fact, the author remarked, indicates that, with the elimination of moisture from the sealing medium, the greatest cause of trouble in this type of holder is removed.

## A NEW SEPARATING SYSTEM.

Naturally the holder builders, observing what were the difficulties encountered in operating their holders, without loss of time set to work to devise means to prevent a recurrence. For the removal of the condensate, they have installed a separating system which consists substantially of:

1. An increased depth in the tar dam to provide more time for separation of tar, water, and oils within the holder.
2. Additional skimmers—seven in the case of the Harrison holder—to remove more effectively the condensate from the surface of the tar dam.
3. An automatic timing device, to provide frequent and short skimming periods.
4. Heating elements, to ensure that the moisture in the tar dam is fluid, so that it may readily flow to the skimmer and be removed.
5. A separating tank, in which the tar and condensate can separate; the condensate being removed, and the tar returned to the holder. The design of this tank is such that, in the event of the disarrangement of the automatic pumping mechanism, it is practically impossible to lose any of the sealing medium from the system.

This system has not been in operation sufficiently long at Harrison to permit of the collection of reliable data; but the builders state that, in the case of another holder operating under practically the same conditions, a sealing tar which had become heavily contaminated with the condensates thrown out of the gas, when treated in the separating arrangement, rapidly lost its water and oils, and was in condition to return to the sealing system.

## DIFFICULTIES FEW AND OF A MINOR CHARACTER.

The difficulties with the holders in operation on the works of the author's Company have been so few, and of such a minor character, that, considering the success of the steps taken to prevent the accumulation of condensate, they do not anticipate any serious trouble during the coming winter. Records taken daily on all the holders in their service have failed to show even a tendency of the piston to tilt. No escape of gas into the space above the piston has been recorded. The mechanical performance has been all that could be expected. No indications of sticking or undue stresses have been observed.

## WHAT IS NECESSARY.

The experience of the Company, however, teaches them that continuous and competent inspection is necessary, and that close watch must be kept over the sealing medium, in order to prevent any possibility of its carrying excess moisture, or otherwise becoming unsatisfactory. Immediate replacement of damaged glass, and care in keeping doors and ventilators closed, are requisite. Rigid inspection and maintenance of electrical equipment are called for, from the standpoints of both insulation and operating condition; and a man trained in the handling of electrical apparatus should at least supervise this. Neglect of this item will probably cause more grief than any other one thing. The Company think it well to have dual electric feeders from the source of supply to the holder, with each feeder supplying alternate pumps. In large and important holders, this is essential. Each feeder should be of sufficient capacity to carry the total load. If the holder station is apt to have electrical interruptions extending over lengthy periods, and a steam-driven generator is not available, a stand-by gas-engine driven generator set is recommended.

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**Institution of Heating and Ventilating Engineers.**—The Council announce that they are in a position to award several prizes for original papers during 1927 on subjects connected with heating and ventilating. Among them is a British Commercial Gas Association premium of ten guineas for the best paper on "The Use of Gas in Connection with Heating and Ventilating." Papers submitted must be the sole composition of the competitor; the qualification being that such competitor is either a student attending a Technical Institute or an Assistant actively connected with the business or profession of heating and ventilating in Great Britain and Ireland, and is not a principal or an employer. The list of subjects for papers prepared by the Institution of Heating and Ventilating Engineers, a copy of which may be obtained on application to the Secretary, 38, Victoria Street, London, S.W., is suggested as a guide for the subject to be chosen. It is intended that the paper should be not more than 7000 words; and originality will be considered the important factor when judging the papers sent in.

# SERVICE AT PURLEY.

## A Promising Business-Getting Proposition.

**These are times when the business of gas supply calls for ever-increasing efficiency of service, and when competition requires that the capabilities of the industry should be demonstrated under the best possible conditions. For the former, perfect organization and working arrangements are essential; and for the latter, it is equally necessary that there should be adequate and suitable provision for display. These considerations are fully met in new showrooms and offices lately opened in Brighton Road, Purley, by the Croydon Gas Company; and the Directors and Mr. W. J. Sandeman and his staff are to be congratulated upon a very enterprising piece of work, which must inevitably result in increased business.**

Actual building operations in connection with the new premises were commenced at the beginning of August last year; and the opening took place on Dec. 6. The week commencing on that day formed an "invitation week." A special invitation card was sent to every consumer in the district to be served by the new depôt—these numbering about 8000. Teas were served each afternoon; hospitality being extended in this way to between 700 and 800 persons, while many hundreds in addition paid visits of inspection.

### A Good Position.

The building, which occupies a prominent position on the Brighton Road, and in the heart of the Purley shopping area, is, both in position and design, admirably adapted to its purpose of meeting the needs of a rapidly growing good-class residential district, which holds out abundant promise for the future. At the present moment building is being carried on at a rapid rate; but there still remains great scope for development, which will certainly take place. In these circumstances, the Company have taken a wise step in seeking more commodious accommodation than they formerly possessed at the corner of Purley Road and Brighton Road.

The new building possesses a frontage of roughly 70 ft., and to it will be attached in all about fifty employees, who will be engaged in serving part of South Croydon, Purley, Coulsdon, Kenley, and Sanderstead. It is in red brick, with a red tiled roof; the front being partly in masonry. The Company's name and the metal work of the windows are in coinage bronze finish, which gives a dignified tone to the general appearance. Outside lighting is provided by seven Sugg "Rochester" cluster lamps, all fitted with automatic distance lighters controlled from inside the showroom. The Architects (Messrs. Berney & Son, of Croydon) have designed a handsome building, admirable for the purpose it is intended to serve; and Messrs. Higgs & Hill, as the general contractors, have done their work well.

### Show Windows

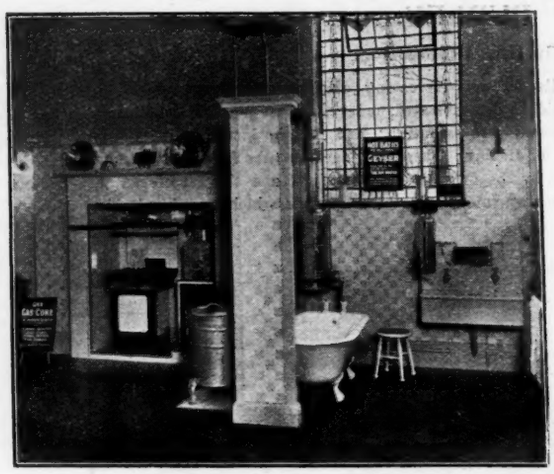
There are two main windows, one of which is at present tastefully furnished as a drawing room, in which is an appropriate gas fire with ornamental surround, and a beautiful antique brass gas pendant, fitted with a tango flounce. The second main window is devoted to the exhibition of cooking stoves; and here is another equally beautiful oxidized silver gas pendant, with a green flounce. These shaded pendants give a delightfully soft lighting effect to the windows.

In a similar square window at one end (which will normally be set apart for coppers, geysers, &c.) there is now arranged a special show of smaller gas appliances convenient for Christmas gifts—a display which may with safety be reckoned upon to draw the attention of the passer-by. Then on either side of the doorway is a space—in one case occupied by a "Nautilus" coke boiler and samples of the Company's coke in helmet buckets; and in the other, by samples of Wilsons & Mathiesons' "Sunbeam" fires.

### And Showroom.

On entering from the street the main showroom, which has an area of 2530 sq. ft., the visitor is faced at the farther end by a counter, a portion of which is shut off by a heavy brass grille. The direct object of the call may be merely to pay an account or to order a supply of coke for the ubiquitous stove. But even so, during the time it takes to pass from door to counter the Company will have accomplished some helpful propaganda work. Though the Croydon Gas Company's customers are well served indeed, it is probable that the great majority of them will be brought face to face in the showroom with some method of utilizing gas which is new to them, or at any rate better than that which they have previously adopted. An increase in the number of consumers, necessary as it may be, is certainly of no more importance to the progress of a gas undertaking than an increase in consumption per head of the existing customers; and it is in this direction that a modern showroom such as that at Purley, replete with the latest appliances which will "do it better with gas," is able to render invaluable assistance.

Perhaps the visitor will be one of those—there are some about—who think the lighting load of the gas industry is passing into a back number. If so, it must be a surprise to find that there is no more modern, no more decorative, and no more effective means of illumination than can be secured by the use of any one of the innumerable choice lighting fittings



that are displayed. The main lighting here is by five Sugg semi-indirect bowl fittings, with automatic distance lighters controlled from a switchboard. In different parts of the showroom are alluring Evered candle brackets with a variety of silk shades, and also several standard lamps. The decorative nature of these fittings and the wide range of patterns available—together with the convenience of the gas switch for domestic purposes, which is demonstrated in a number of ways—should be sufficient to convince the most sceptic that we are still living in an age of gas lighting. The lighting business is there to be had; but in order to secure it, it is now more necessary than ever to show what gas can accomplish. For this purpose, of course, a well-appointed showroom is essential.

The entire scheme of the showroom and other main parts of the building is in light oak, and the panelling and fitting have been carried out by the Nautilus Company in that style by which the firm have made themselves a name in connection with work of this description. All round the showroom there is handsome light oak panelling; and it has an oak floor, and green distempered walls. On the left-hand side from the entrance there is a cosy inglenook; and this naturally proves a great source of attraction. This is provided with a "Sunbeam" fire and two candle brackets with tango shades. The remainder of this side is occupied by a gas fire panel, in which are four fires so arranged that they and their tiled surrounds can be changed from time to time. The other side is devoted to kitchen and bathroom exhibits. There are three stanchions in the room, with squares at the base into which in two cases are fitted four changeable fires, and round the third four cookers are placed. A bright effect is given by the attachment of tall mirrors to the upper portion of the centre stanchion. The general furnishing—in oak and leather upholstered—is simple but dignified in character; and the tables and chairs in front of the fire panel constitute a small lounge, which is much appreciated by lady visitors at the close of a walk round.

There is an all-gas kitchen, in full working order, which comprises a Potterton boiler, a "New World Junior" cooker, and a fire, the whole being arranged in a ventilated recess which has white-glazed tiles and red quarry hearth. In the bathroom is a New Geysers, Ltd., "Reliance" geyser, which, as is the practice with the Company, is provided with flue piping in copper to match the appliance. This makes a very neat job. The section is completed by a gas-heated towel rail and a lavatory basin with hot and cold water supply. Dotted about the place are, in particular, Davis beaten metal fires in pewter and brass, and a variety of Wright's and other makers' fires finished in different colours by the Gas Company's own enamelling process. Nowhere is there any suggestion of overcrowding; ample room being left for inspection of the various appliances, which are thus set off to the best advantage. A minor, but not unimportant, point is the good appearance of the announcements, in white lettering on a black background with green lining.

### DEMONSTRATION HALL.

On the first floor, reached by a spacious and massive oak staircase (lighted by two Sugg "Flambeau" fittings), is a lecture and demonstration hall, capable of holding 200 people. At one end is a raised platform, with sink to which hot water

is supplied by an independent Richmond "Lyn" boiler; and at the other there is an attractive gas kitchen installation, consisting of cooker, fire, and boiler, in a tiled and ventilated recess. It is a lofty room, with an arched roof; and the acoustic properties appear to be particularly good. The heating is by means of gas radiators; and the lighting is by four Sugg ventilating lamps fitted into the ceiling.

Here it is proposed to have cookery lectures on similar lines to those which have for a long time past been a feature at the Company's main offices, in Katharine Street, Croydon, where they have been very well attended—the audiences averaging about 150 at lectures given on one day each week. Behind the lecture hall there is a small anteroom for the use of the demonstrator and for the purpose of private interviews.

### OFFICE, STORES, AND SHOP.

Behind the showroom there is an inspector's office and a large and well-lighted store, the area of which is 1710 sq. ft. The office is so arranged that the inspector can overlook the stores and the fitters' yard. A Richmond "Hollar" boiler supplies hot water for washing to this portion of the premises. On an extremely cold morning, there was found to be genial warmth everywhere. The fitters enter from the yard, and ring on opposite the inspector's office; and they then pass out through another door to the stores, where there is a counter of such length that each one can be served with what he requires without waiting. The fitter then goes out at the other end of the store. This procedure prevents delays; and there is no doubt that adequate arrangements for furnishing the men promptly with their orders and goods results in the saving of money, as they can get earlier on to the district, and unremunerative time is reduced to a minimum.

Leading from the yard (with its covered truck shed) is a commodious fitters' shop, equipped with benches, and so forth. For each fitter there is a locker; and care for the comfort of the men is manifested by the provision of wash basins supplied with hot and cold water.

The remaining portion of the premises is residential, being occupied by the district inspector.

## CONDITIONS AFFECTING THE NATURE OF COKE.

**[From "Das Gas- und Wasserfach," Oct. 16, 23, and 30.]**

Dr. H. Bähr and Dr. F. Fallböhmer describe, at considerable length, investigations which they had jointly undertaken into the effect of carbonizing conditions and of various chemical additions to the coal upon the nature of the coke produced. They explain that the work was carried out some time ago, and publication has been unavoidably delayed. In spite of the attention which this subject has received of recent times, however, they claim that no other investigator has worked along the same lines, and that publication is not superfluous.

A special apparatus, which is described in detail and illustrated, was devised to ensure conformity with certain exactly defined, but varying, coking conditions. The same brand of coal was used throughout, and it was cleaned down to a uniform ash content of 0·7 to 0·8 p.ct. This was coked at temperatures of 550°, 750°, 950°, and 1150° C., alone, and also with a variety of purposely admixed chemical substances. The individual coke samples were systematically tested for combustibility, reaction temperature, and reactivity, as well as real and apparent specific gravity and resistance to friction. For testing these pyrochemical properties, a special apparatus was designed by means of which all three values could be determined in one experiment for each sample. The reactivity could be tested also with either oxygen, carbon dioxide, or air. This apparatus is fully described and illustrated.

The authors found that the values for the pyrochemical properties (combustibility, reaction temperature, and reactivity) diminished considerably as coking temperatures rose. This held good also for coke containing an admixture of 6 p.ct. of silicic acid. The reactivity of a coke containing 3 p.ct. of $Fe_2O_3$ was considerably better than that of the pure coke, and 6 p.ct. of iron oxide gave still further improvement. While the values for all three properties remained in a certain constant proportion to one another for ash-free coke and coke containing silicic acid, this applied, in the case of coke containing iron, only to the combustibility and the reaction temperature. The re-activity, on the other hand, increased comparatively much more rapidly. This means that determinations of combustibility and reaction temperature may generally be deemed as sufficient indication of reactivity, though cokes containing iron must be regarded as an exception to this rule. Manganese and copper admixtures showed the same effect as iron, but zinc had no effect.

A coke prepared with 3 p.ct. of $Fe_2O_3$ and 3 p.ct. of $SiO_2$ proved interesting. The 550°, 750°, and 950° samples behaved normally—that is to say, in the same way as the corresponding 3 p.ct. $Fe_2O_3$ cokes—but the sample coke at 1150° showed no effect of the iron in the reactivity test made at 950°. The value was the same, in fact, as for the corresponding coke with no admixture. This also held good in combustibility tests in either carbon dioxide or air. When, however, the reactivity test was made at 1100°, a value was found which again showed the catalytic effect of the iron. Obviously, in coking at 1150°, a state of equilibrium between $SiO_2 + FeO \rightleftarrows FeSiO_3$ is attained, which at 950° can be made to revert very slowly to the left side. Thus there is in the coke, when the combustion process is taking place at 950°, an iron silicate which exercises no catalytic influence.

In order to determine exactly what is responsible for the more favourable pyrochemical results in the lower-temperature coke, ash-free samples were maintained at a temperature of 1150° C. for a few hours. There was no resultant change in reactivity. If this heating-up process was put through very quickly, however, slight changes were to be observed in the pyrochemical properties. The fall in the value for reactivity in such cases could be almost entirely compensated by passing over the coke, while in glowing condition, a stream of gas containing benzole vapours. From this the authors drew the definite conclusion that reactivity is not influenced by the quantity of volatile constituents in the coke, but only by modifications in the condition of the carbon.

The determinations of reactivity showed somewhat higher values with air than with either oxygen or carbon dioxide. Reactivity tests carried out at 1100° gave relatively the same differences for different coke samples as at 950°. From this it was deduced that the values found at 950° were no mere arbitrary figures, but that the same influences affecting the carbonization process hold good at higher temperatures.

The real specific gravity of the coke showed also considerable dependence upon the coking temperature, which is only to be expected, since, in its determination, other influences such as general structure and cell formation are excluded. Little relationship between the apparent specific gravities of the various samples could be traced, and the same remark applies to cell-space. It was noteworthy, also, that no relationship could be established between cell-space and reactivity.

Resistance to friction was determined by means of a variation of Schmolke's apparatus. Values for this rose, in general, with increasing coking temperatures, and with increasing quantities of foreign admixture. That is not to say, however, that maximum hardness was in every case attained by coking at 1100°.

Experiments were made with samples containing iron to ascertain the presence, or otherwise, of iron carbide in the coke, but none could be proved. Likewise no trace of iron silicide could be established in the samples containing iron oxide and silicic acid.

Summarizing their findings, the authors maintain that the pyrochemical and physical properties of the coke are determined to a very great extent by the condition of the carbon, and that this, in turn, is determined by the temperature at which the coke is produced. Reactivity can, however, be considerably influenced by catalyzing agents during the coking process.

## THE "MANCHESTER JUNIORS" AT THE STRETFORD GAS-WORKS.

The Engineer and General Manager of the Stretford and District Gas Board (Mr. W. M. Carr) has forwarded the above interesting photograph of the visit of the Manchester and District Junior Gas Association to his works. The report of the proceedings on the occasion appeared in the "JOURNAL" last week.

## SOME ASPECTS OF THE FUEL PROBLEM.

By E. W. SMITH, D.Sc., F.I.C.

**[Before the Glasgow Section of the Society of Chemical Industry on Dec. 15.]**

**[Extracted.]**

It is well known that scientifically-trained men can specialize in fuel, and take training courses at some of the modern universities. It is rare to find that there are courses of a co-ordinated nature spread over a period of years in many of our technical schools. It is rarer still to find that fuel is dealt with in any way at our public schools, secondary schools, or elementary schools. I am fully aware that individual items, such as the subjects as heat and light, can be indicated as having a bearing on fuel, but to my mind that is not enough.

There would appear to be no shortage of research work and research workers in fuel. The Fuel Department of the Leeds University specializes in the problems relating to the gas and coking industries. This University appears to have been the first to raise the subject to the status of a Degree. Sheffield University specializes in the problems relating to the mining and coking industries. Birmingham University is dealing more particularly with petroleum and coal treatment. The Imperial College of Science concentrates on important fundamental problems. The Fuel Research Board is directing valuable work on many subjects relating to fuel. The Federation of Iron and Steel Manufacturers has its Fuel Division; the Federation of British Industries also has its Fuel Division; and the Association of leading firms in Lancashire and Cheshire has its Research Organization.

The Society of Chemical Industry has always had its doors open to fuel subjects. It has always been recognized that, without fuel, there would be no chemical industry. Chemical industry, as understood to-day, may cover every conceivable national industry, because, if any industry is to be run under the best commercial conditions, it has a chemical side to it which must not be neglected.

In order to prevent overlapping, and to encourage co-ordination, a Joint Committee of the Fuel Section of the Society of Chemical Industry, the Institution of Gas Engineers, and the Coke Oven Managers' Association has been formed to run national congresses; and the latest development is the close co-operation of this Joint Committee with the English Section of the World Power Conference, which is holding a meeting on the subject of fuel in the autumn of 1928.

Anyone who has read the inspiring and illuminating Presidential Address of Sir Alfred Mond, delivered recently at the annual meeting of the Institution of Fuel Technologists, will be struck by the insight into the fuel problem displayed by Sir Alfred. He is also Chairman of the National Fuel and Power Committee, set up by the Board of Trade, which has for its objective—

> To consider and advise upon questions connected with the economic use of fuels and their conversion into various forms of energy, having regard to national and industrial requirements in the light of technical developments.

Sir Alfred urged the need for the co-ordination of the work and activities of all institutions interested in fuel. As a start, he was arranging the fusion between two Institutions of which he is President—the Institution of Fuel Technology and the Institution of Fuel Economy Engineers. He hoped that the Fuel and Power Committee, of which he was Chairman, would be a big force in bringing about this co-ordination.

There is no doubt that co-ordination among institutions, and particularly institutions relating to fuel, is required. It will never be possible, however, for one institution to represent all fuel interests. It is not conceivable that the Institution of Gas Engineers, or the Coke Oven Managers' Association, or even the Society of Chemical Industry, will sink its identity in the Institution of Fuel Technologists, whether each of these Institutions is represented on its Council or not. An institution has to be one of two things for it to be truly representative. It must represent either individuals only, or institutions only; if the latter, then it immediately becomes a federal council.

For some time I have felt very strongly that it would be of national advantage if a federal fuel council were to be formed, representative of other institutions and research organizations. Its chairman could be the chairman for the time being of the National Fuel and Power Committee. Its vice-chairman could be the Director of the Fuel Research Board. Each of the following Institutions could, with advantage, be represented on this council:

The Institution of Gas Engineers.
The Coke Oven Managers' Association.
The Fuel Section of the Society of Chemical Industry.
The Institution of Petroleum Technologists.
The Institution of Fuel Technologists.
The Institution of Fuel Economy Engineers.
The Institution of Electrical Engineers.
The Fuel Research Board.
The Fuel Division of the National Federation of Iron and Steel Manufacturers.
The Fuel Division of the Federation of British Industries.
The Safety in Mines Department.
The Fuel Departments of the following Universities: Leeds, Sheffield, Manchester, Birmingham, and the Imperial College of Science.

The primary function of the federal council would be to make joint representation on all matters where joint representation is desirable, and to act in an advisory and co-ordinative capacity on request from sectional interests.

In the meantime the Fuel Section of the Society of Chemical Industry will carry on its work of co-ordination and co-operation in the creation of a "fuel sense" in all industries, and a greater appreciation of the importance and possibilities in the study of fuel by all concerned. It is not desirable that out-and-out bureaucratic methods, through intensive organization, should be tolerated, but there is a big gap between the chaos that is possible, and bureaucratic control; and it is the happy medium, allowing full play to individual initiative and effort, which is the end that is desired.

Another matter of primary importance to industrialists with which Sir Alfred dealt was his point of view that research should not be paid for out of profits, but should be regarded as capital expenditure. If industrialists could be brought to the same point of view, a radical change would immediately take place in their attitude towards research. It is a great deal easier to bring about development out of capital than out of revenue. It places a much greater responsibility on the research workers—a responsibility which is salutary and beneficial in every respect. Research needs to be organized on business lines, like any other activity in industry; and this does not need to interfere in any way with the efficiency, independence, and individuality of the research workers. It presupposes the right attitude of mind in a chairman of directors, and a breadth of view which is not over-frequently met with.

# GAS INDUSTRY AND THE COAL STOPPAGE.

## Facts which Should be Remembered.

**Presiding at a luncheon on Tuesday of last week, which took place in connection with a meeting of the National Gas Council at the Royal Palace Hotel, Kensington Mr. D. Milne Watson, D.L., LL.D., Governor of the Gas Light and Coke Company, made an important statement with regard to the gas industry in relation to the prolonged coal strike.**

Mr. MILNE WATSON said: Ladies and gentlemen,—In welcoming you here to-day, I had intended to pass an eulogy upon the performances of the gas industry during the prolonged coal stoppage which has now happily come to an end. I find myself, however, rather in the position of the rabbit in the famous French story, in which it is said that "the rabbit is a savage animal who defends itself when attacked." Within the last day or two, there have appeared in various quarters criticisms of the gas industry which show at least that memories are very short as to the great boon that the industry has bestowed upon the public during the past seven or eight months; and so perhaps you will excuse me if I to a certain extent amplify the little tale that I had intended to tell you.

### NOT UNPREPARED.

The commencement of the coal stoppage at the beginning of May did not find the gas industry unprepared. Both companies and municipalities had laid in large stocks of coal in anticipation of the strike. These stocks in due course were drawn upon; and they were so extensive that in most cases, I believe, they were sufficient to last at least three months. But then there came the question of what was to be done; and we became very anxious about the future. We spent our time asking those who were supposed to know most about the matter when the stoppage was likely to come to an end. Some people in the early days of the strike said it would last only a few weeks, and others that it would continue for a month or two. Some pessimists, as they were then supposed to be, said it would at least go on until August; but the gas industry doubted whether it would be over even then, and began to purchase coal where it could be secured. Later on the suggested dates for the termination of the strike were shifted, in turn, to September, October, and November; but, as you are aware, all these prophecies eventually proved to be wrong, and the stoppage continued until December. In our anxiety to find out just what we had to provide against, we sought the views of all sorts of people—colliery owners, representatives of labour, and even Ministers of the Crown. We also consulted people whose business it is to go about the face of the earth and find out things. But none of them could tell us the date when the stoppage was likely to be over. Now, ladies and gentlemen, do you really think that, in circumstances such as these, the gas industry could have fixed the date for itself? It was quite impossible.

### GAS UNDERTAKINGS CANNOT LIVE FROM HAND TO MOUTH.

The strike went on and on; and even to-day, when it is supposed to be all over, many of us have received very little English coal—and some of us none at all. ["Hear, hear."] That is a very serious position. If I may be allowed to illustrate the point of the experience of my own Company—the Gas Light and Coke Company—I may say that up to the present day (Dec. 14) we have received from our English coalfield, in the Durham district, exactly seven cargoes of coal, which are sufficient to supply us for two days. Where should we be to-day, if we had not purchased these hundreds of thousands of tons of foreign coal? And where should we be to-morrow, and next week, at Christmas, and in the New Year, if we did not have coals coming from America, India, Germany, and all over the world, to help us through the next couple of months? I do not think people realize the fact that the gas industry cannot live from hand to mouth in the matter of its coal supplies. It is absolutely essential that gas undertakings should have a stock of coal; and this stock should be sufficient to last not less than from six to eight weeks—and nine weeks in the winter time. Again I say, where should we be now if we had not taken time by the forelock and purchased the coal we required overseas? People are mistaken if they think it is possible to sit in an office in London, or any other place, and send off a telegram in the morning, and, hey presto! a trainload or shipload of coal arrives. To secure (say) American or German coal at a time when everybody was clamouring for supplies took, not two or three days, but two or three months; and therefore the only way to get what we required was to buy well in advance. So it came about that, owing to the uncertainty as to when the strike would end, it was absolutely essential that the coal should be bought long before there was any chance of the undertaking running short. It was only because we had the sense and the prevision thus to buy in advance that people are at the present moment able to enjoy the blessing of a gas supply. Consequent upon the difficulty of arranging the purchase of the coal, the trouble of getting boats when it was purchased, and the necessarily long voyages involved, the coal that is coming into this country now was purchased for the most part in August and September. In those months what prospect was there of the strike ending? None at all. And so the only thing that the gas undertakings could do was to purchase at least two months ahead. Of course, we all of us knew perfectly well that there would be difficulties at the end of the strike—a sort of over-lapping, as it were—but I do not see how this could have been prevented. As I say, we approached everyone, in the Government and elsewhere, to see if we could learn when the strike was likely to be over; but in September, when the coal we are now using was bought, we were without any semblance of a date for the finish of the stoppage.

### EXTRA COST OF FOREIGN COAL.

That coal has now to be taken, and it has got to be paid for. We cannot cancel it, or, if we did, it would only be at a terrific cost, which would amount to the same thing in the end. I do not want to burden you with many figures; but I think it is well that people should know that the Gas Light and Coke Company alone have had to buy 1,600,000 tons of foreign coal; and the price of that coal has been something like £2,400,000 beyond what we should have paid in normal circumstances for English coal. I am referring to the foreign coal we have already received and that which will be coming to hand during the next few weeks. If you allow on the other side a credit of £500,000 for the extra price received for coke, there still remains a net debit balance of £1,900,000; and this amount has got to be paid.

### GAS CONSUMERS' ADVANTAGES.

Now, what about the consumers of gas? They have been in the happy position of having some one whose duty it was to supply them, on the simple turning of a tap, night and day, with all the gas that they desired; and for the greater part they did not have to pay for it on the spot. They run, most of them, a credit account; and at the present moment many have paid practically nothing at all for gas supplied to them over this difficult period. And now, because the strike is over, there is a demand in certain quarters that they should be relieved of the payment of anything extra, while the gas undertaking is still receiving foreign coal. At the present moment the gas industry is living on foreign coal, and it will continue so to do for the next couple of months at least. The consumer must remember that it is this foreign coal which has enabled him, through the gas industry, to have his meals cooked and his house kept warm; while factories have been kept going, where their source of heating or power was gas or coke. Consumers have been enjoying all these advantages ever since May; and all the time the gas industry has been bearing the "heat and burden of the day" for them.

### SMALL PRICE INCREASES.

Take, again, the case of the Gas Light and Coke Company—it is much like many others. For four months after the commencement of the strike there was no increase in the price of gas. For one month the consumers paid 0·2d. per therm extra, for two months 1·2d. per therm extra; and now, with the latest increase, they will be paying 2·2d. extra—in all an advance of about 23 p.ct., whereas the coal we have been buying has cost anything from 100 to 150 p.ct. more. In fact, we have paid in extreme cases 250 p.ct. above normal prices. We know this is a world in which one gets very little thanks for what one does; but I do think that people should remember all the gas industry has done for the nation during this strike. In addition to supplying the public with the means of cooking, heating, and lighting, many hospitals have been enabled to keep going by the aid of gas; and gas, too, has kept many thousands of factories and businesses going. It seems sad that, after all these services—for which, as I say, the consumer has been called upon to pay very little extra—people should turn round and say the companies are charging too much for their gas. The gas industry has played a very important part during the strike, in helping to keep the country going; and it should not be blamed for having put up its prices to the moderate extent it has done. The additional income for gas that the Gas Light and Coke Company have received to date has amounted to only £170,000, to put against the £1,900,000. There is no profiteering in the gas industry. We are under restrictions which bind us hand and foot; and it is in the interest of every undertaking to reduce the price of gas as soon as possible. ["Hear, hear."] We cannot, however, do the impossible—that is to say, we cannot reduce the price before the coal we have had to buy has been paid for. In conclusion, I would say that the gas industry is a public utility service, with special rights and privileges, and special counterbalancing duties. To fulfil those duties in the spirit and

the letter has been its aim throughout the anxious seven months now happily over—though our secondary difficulties are not—and we are proud to-day to be able to say that we have not failed. [Applause.]

On the proposition of Mr. WILLIAM CASH, the Chairman was cordially thanked for his statement.

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Mr. Milne Watson's reference to what the gas industry has done for the nation during the strike—in addition to supplying the public with the means of cooking, heating, and lighting—may be amplified by the following notes which had been prepared for the occasion.

### WATER SUPPLY.

A number of towns were dependent upon gas or coke for their ordinary water supplies. Such an important town as Leamington Spa, for instance, with 30,000 inhabitants, depends for its water supply entirely upon two pumping stations, one driven by gas engines and one other by steam boilers. During the coal stoppage the gas undertaking continued to provide gas for the former and also supply coke for the latter; and on it, therefore, the water supply entirely depended.

### SEWAGE.

It is quite impossible to estimate exactly how the unemploy- with a population of a quarter of a million, the sole power for sewage pumping is provided by town gas; and this was, of course, continued without failure through the stoppage. In London the emergency pumps for dealing with storm rainfall, of which there was plenty during the strike, are driven by 3000-B.H.P. gas engines. Had they been out of action, parts of London would have been flooded with sewage.

### PREVENTION OF UNEMPLOYMENT.

It is quite impossible to estimate exactly how the unemployment figures would have risen, even in an individual town, had the gas industry ceased to function. But the following statements, taken from a large volume of interesting facts from all over the country, give some idea of what must have been the effect in some of the leading industrial centres.

In Birmingham, especially, the dislocation caused by the strike would have been enormously increased but for the fact that the supply of gas and coke was maintained, as there is a very large and varied list of firms engaged in the metal industry in that city all of whom employ gas for one or more heat processes vital to their manufactures. These include, to mention a few typical cases, the manufacture of motor cars, motor cycles, bicycles, rifles, sporting guns, wireless apparatus, electrical insulators, billet forgings, rolled bars, aluminium die castings, light metal stamping, clocks, and gramophone parts. Had the home supply of these failed, our foreign competitors would at once have stepped in.

In Coventry, a city famous for its motor industries, thirty large firms take over 30 p.ct. of the total output of gas. Had they been compelled to close-down through lack of gas supplies, it is estimated that no fewer than 17,000 persons, or one-third of the total population, would have been thrown out of employment.

In a Derbyshire engineering town of only 60,000 inhabitants (Chesterfield), failure of gas and coke supplies would have thrown 5000 or 6000 out of work.

In the city of Nottingham, several thousands would have been unemployed if the gas undertaking had not been able to supply one large works with gas and coke for generating power which previously had been provided by their own plant. There are many other instances of the gas industry, not merely keeping their former customers going, but coming to the rescue of firms previously dependent on other methods of obtaining power and heat. In one case at least—at Ludlow—the gas undertaking saved the electricity undertaking from ceasing its supply.

In Northampton the boot trade would have been paralyzed had the gas-works closed; while in Norwich the headquarters of the "Mustard Club" would have had to close its portals. The breweries, also, would have had to cease brewing for lack of coke.

In the Lancashire textile town of Accrington, with only 40,000 inhabitants, 5000 to 6000 people were kept at work who would have been unemployed but for continued gas and coke supplies.

Carlisle, with only 50,000 inhabitants, has over 10,000 employed in works—principally biscuit, tin box, and textile manufacturers—which are dependent upon gas and coke, and which were able to carry on throughout the stoppage.

The great city of Liverpool, which is commercial rather than industrial, would have had at least 30,000 persons added to its roll of unemployed as the direct result alone of a failure of gas and coke.

From Stafford it is reported that 7000 men, or a quarter of the whole population, would have been thrown out of work in the same circumstances.

In the shipyards, engineering shops, glass works, and lime works of Sunderland, although business was already very bad, a further 17,000 would probably have been unemployed but for the continuance of gas and coke supplies.

From the great Yorkshire manufacturing city of Sheffield it is actually reported that, "in the cutlery and lighter trades, few firms were affected as regards fuel, because of the unrestricted supply of town gas. Most of the firms were already equipped with town gas appliances for heating, and the inability to obtain coal caused little or no inconvenience." It is added that there were "hundreds of firms in the city fully equipped with gas furnaces for the finishing processes of steel; and although they had difficulty in securing solid fuel for actual steel melting, they were able to keep their works open, and many men employed, during the whole of the strike."

Six firms alone in the quite small manufacturing town of Luton state that, but for gas and coke supplies, 3000 men would have been unemployed.

Again, the Lancashire town of Stockport, with its 120,000 inhabitants, reports that about fifteen firms, mostly in textile manufacture, would have stopped work altogether if the gas undertaking had failed them, and some forty others in various kinds of industry would have been "gravely affected." The total unemployment in this town which would have been the direct consequence of a failure of gas and coke supplies is put at 20,000 to 25,000.

In Glasgow it is estimated that trades employing 43,000 persons would have had to turn them off had no gas or coke been forthcoming—such an industry, for example, as that of making sewing machines, which employs 6000 hands, being dependent on gas for the heat treatment of the metal parts.

In Dundalk nearly 600, and in Waterford 300, workers would have been thrown idle.

In addition, it may be noted that newspapers almost everywhere would have been at least seriously embarrassed by a failure in the supply of gas, on which the majority to-day almost entirely depend for stereo-metal melting and other processes in printing, as well as for the power in some cases to operate their machines.

Furthermore, a great part of the public lighting of our towns and cities would have ceased; many railway stations and repair sheds would have been put in darkness; Government dockyards and engineering shops would have suffered grave inconvenience; hospitals and nursing homes, in particular, where gas is very freely used for cooking and heating on account of its perfect cleanliness, would have been very badly hit—with serious consequences to the patients; and schools, asylums, convents, and many other institutions would in many instances have been compelled to close for want of gas and coke.

### VALUE OF GOOD RELATIONS.

But there has been no stoppage. The disasters mentioned as typical of many others threatened throughout the country have been averted. The supplies of gas and coke have been kept going. How has it been possible? First, by having good stocks in hand, and then through the devoted efforts of all our staffs and managers, and the excellent relations which exist in the gas industry between the employers and their men, who, because they know by experience the value of settling all questions between the two parties by friendly negotiation, had no hesitation in preferring the wider interests of the whole of their fellow workers (who but for them would have been starving and out of employment in their millions) to the narrower interests of one section of the working population, however much they may have sympathized with their desire for short hours and long pay.

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**Industrial Gas Heating.**—The development in engineering—civil, gas, mechanical, and electrical—was discussed by Dr. C. M. Walter, head of the Industrial Research Laboratory of the Birmingham Gas Department, in his Presidential Address to the Midland Section of the Junior Institution of Engineers in Birmingham. Dr. Walter predicted that the imports of motor spirit would continue to increase, but thought it was doubtful whether the use of fuel oil for industrial operations would do so, owing to the enormous advance which had taken place in the design of gas heated furnaces. He referred to the great increase in the output of gas for industrial heating, and also to the manner in which it was gradually replacing coal for domestic heating. It was, he said, particularly interesting to observe that throughout the period of the coal stoppage the factories of Birmingham were enabled to enjoy full supplies from the Gas and the Electricity Departments; and, as a result, many thousands of people were saved from being thrown out of employment.

# LONDON AND SOUTHERN DISTRICT JUNIOR GAS ASSOCIATION.

## Results of Centralized Control of Retort Houses.

**Mr. C. M. Croft, in a practical paper, gives details of the centralized control of retort houses at the Wandsworth Gas-Works. He contends that, if the calorific value of the gas is maintained constant from each retort house, more therms per ton of coal are obtained than when the quality is sometimes above and sometimes below, though giving an average equal to, the standard value.**

The December meeting of the Association, which was held on Friday evening last at the Westminster Technical Institute, Vincent Square, S.W., was attended by a large number of members, and some interested visitors, who had assembled to hear a paper (illustrated by a series of lantern slides) by Mr. C. M. Croft, of Wandsworth. Mr. ARTHUR BROADBENT (the President) was in the chair, and remarked upon the good fortune of the Association in having to address them one so well known in the gas industry as Mr. Croft.

### CENTRALIZED CONTROL OF GAS MAKING AT WANDSWORTH.

By C. M. CROFT, Chief Engineer, Wandsworth, Wimbledon, and Epsom District Gas Company.

This paper is intended primarily to deal with the present system of the control of gas manufactured at the Wandsworth Works, from calorific, volumetric, and pressure standpoints. To enable the method of vacuum control now in operation to be fully appreciated, it is first desirable to give a résumé of the increase in output of the works, and the working conditions which led up to the installation of the plant, the description of which will to a large extent form the subject matter of this paper.

#### DEVELOPMENT OF CARBONIZING PLANT.

In the year 1910 the output of coal gas from the Wandsworth Works was 887,027,000 c.ft., and the carbonizing plant from which this was manufactured was installed in No. 3 retort house. At this time there were two benches of retorts in this building; one consisting of twelve settings of ten retorts each, 21 in. by 15 in. Ω section, 21 ft. long, the other bench containing seven beds of ten retorts, 24 in. by 15 in. Ω shape, and four beds of 21 in. by 15 in. retorts, all 21 ft. long. The arches were primarily built to contain six retorts, but were increased in height and rebuilt for tens; the retorts being placed in five tiers of two. The effect of this rebuilding was that the arches, furnaces, and flues were necessarily more cramped than would have been the case had they been originally built for settings of ten retorts. In the year 1911 a further bench of six settings of ten retorts each, 24 in. by 16½ in., round-bottomed Ω section, was added, and in 1913 another six settings of a similar size were installed, with the result that in 1914 this house had three benches of retorts, and these were the sole source of coal gas manufacture. All the gas taken from this house was collected from an 18 in. outlet on each bench which was in turn connected to a 24 in. atmospheric condenser fixed on the outside of the building, facing east. From this condenser the gas was taken to the exhauster house by a 24 in. main for a distance of 150 yards.

In 1917 the erection of a new (No. 4) retort house was commenced, and twelve beds of ten retorts each, 24 in. by 18 in. by 23 ft. long, round-bottomed Ω section, were installed. This house was of the stage floor type, and was fitted with Drakes charger and discharger, and De Brouwer hot coke conveyor. It was built on the best available site for handling coal direct from large barges, being therefore placed on the riverside at the extreme east end of the works, a distance of nearly a quarter-of-a-mile from No. 3 house. The gas from this house was taken from the bench by an 18-in. main; and owing to the great difficulty and expense in obtaining material at that time, the 18-in. main was laid to the obsolete No. 2 retort house, which had an atmospheric condenser already fixed on the west side of the building. This condenser was utilized for condensing the gas from No. 4 retort house; and an outlet from the condenser was led into the common 24-in. inlet to the exhauster house.

#### EXTENSIONS IN 1922.

In 1922, owing to the continued increase in output, the provision of a further retort house was necessitated. No. 2 retort house as a building then offered itself for these extensions. The shell of the building was in first-class condition, and there was an excellent coal stores running parallel to the side of the house. The building previously contained sixteen beds of oval direct-fired settings of six retorts. These two benches were removed, the foundations strengthened, the roof was heightened, and a modern stage floor house was made, containing twelve beds of ten retorts practically identical with those recently placed in No. 4 retort house. The retorts were charged by a Drakes combined charger and discharger, and the coke was removed by a telpher transporter, being automatically discharged directly into the skips, and removed, with out quenching, to the quenching tanks fixed outside either end of the building. As this house was required urgently for the winter of 1922-23, we were compelled for expediency to connect the outlet main to the partially occupied atmospheric condenser main running outside the house. This condenser was now common to No. 2 and No. 4 retort houses. From the inlet of this condenser, therefore, the gases made in No. 2 and No. 4 retort houses ran concurrently.

#### DURATION OF CHARGES.

In 1910 the old No. 3 retort house was worked by three shifts, and the charges were of eight hours' duration, carried out by machines designed by the former Engineer, the late Mr. H. S. Freeman. In 1911 these machines, which had done excellent service, were replaced by De Brouwer chargers and dischargers, and the charges brought up gradually, first to ten and then to twelve hours. No. 4 retort house commenced its work with twelve-hour charges with three shifts per 24 hours. In 1920 it was decided to make trials by continuing twelve-hour charges, but to work only two shifts of eight hours per 24 hours. The charges were made slightly heavier; and owing to the fact that the charging had to be compressed into a shorter period, the gas was derived from the retort houses in gluts. It will be apparent that this must be the case, as all the charging had to take place in a period of eight hours which previously had been spread over twelve hours, and thus there were two intervals of four hours between each shift when no charging was done. In December, 1923, when No. 2 retort house commenced work, the same system was adopted, and this additional production intensified these periodical gluts of gas, though the difficulty was moderated by breaking-up the shifts in the following manner:

| | |
|---|---|
| No. 2 house . . . . . | 6 a.m. to 2 p.m. and<br>6 p.m. ,, 2 a.m. |
| No. 3 house . . . . . | 8 a.m. to 4 p.m. and<br>8 p.m. ,, 4 a.m. |
| No. 4 house . . . . . | 10 a.m. to 6 p.m. and<br>10 p.m. ,, 6 a.m. |

These gluts were modified, but they could not be eliminated. It will be seen from the plan of the general arrangement of the works that all these retort houses are at varying distances from the exhauster house, and that, owing to the system of connections, they were all subjected to one common "pull" at the exhauster inlets, which caused varying degrees of vacuum at the various retort houses, according to their physical differences and varying distances from the exhauster house. These disabilities were partially remedied by the manipulation of the outlet valve of each retort house and by the provision of retort house governors, but these methods of control did not effectually meet the case. It was found in practical working that the condition of the house with the worst quality gas, or tailings, and subject to local conditions, had to be the one which dominated the whole situation; and there were not sufficient means of selectivity to pull on each retort house as the quality or volume of the gas demanded. The change-over from three shifts to two of necessity effected economies in carbonizing wages; but it was felt that the true economies of this system could not be obtained until other means of control were installed to meet the case.

#### VARYING OUTPUT FROM RETORT HOUSES.

To recapitulate the position at this time, No. 3 retort house, with a capacity of 4 million c.ft. per day, was being charged at 8 a.m. to 4 p.m. and 8 p.m. to 4 a.m.; No. 4 retort house, with a capacity of 2,640,000 c.ft. per day, was being charged at 10 a.m. to 6 p.m. and 10 p.m. to 6 a.m.; and No. 2 retort house, with a capacity of 2,640,000 c.ft. per day, was being charged at 6 a.m. to 2 p.m. and 6 p.m. to 2 a.m. The effect is shown on fig. 2, which indicates that the hourly output of gas from the retort house varied greatly. For instance, on Dec. 20, 1925, it varied from 287,000 c.ft. in one hour to 401,000 c.ft. in another hour during the day, whereas the average hourly make for that day was 349,000 c.ft. The problem which then presented itself was to find the simplest and most economical method of maintaining a vacuum to suit the local conditions of each house, while maintaining as nearly as possible a constant calorific value in the gas made. Many possible alternatives presented themselves; the most obvious way apparently being the fixing of a greater number of retort house governors, so that each bench was subjected to individual control. It was felt, however, that retort house governors would only partially meet the case; their function being a control of vacuum on the hydraulic main without discriminating between volume and quality. It was also felt that this type of plant is very sensitive to wear and tear, and that, to work efficiently, it requires a large amount of skilled and intelligent supervision, thus occupying the time of the stage foreman when he might otherwise be employed

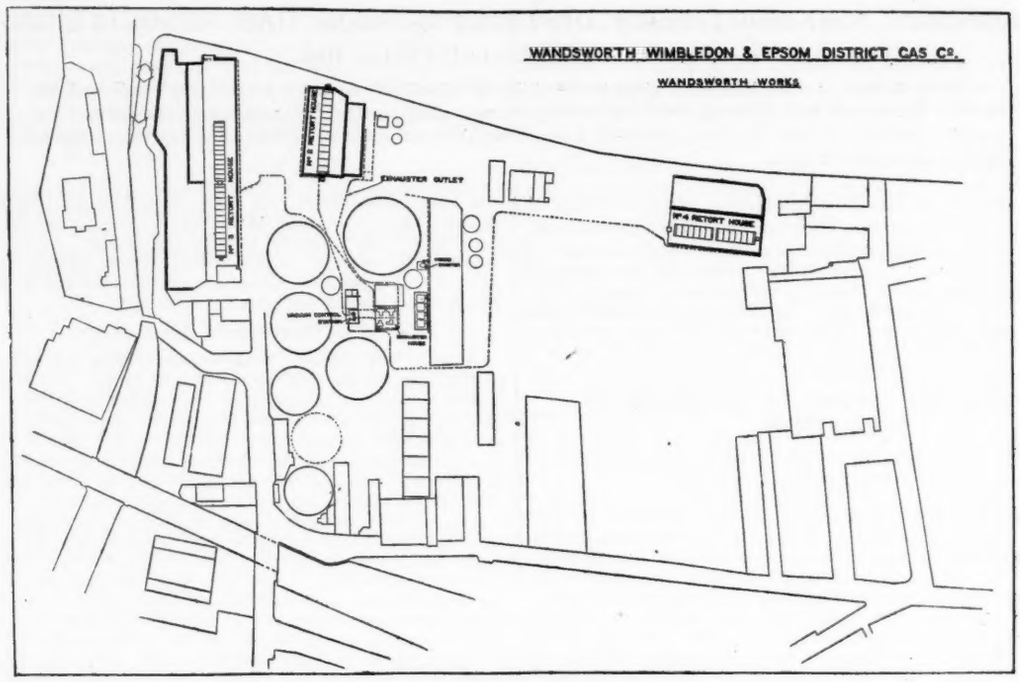


FIG. 1.—PLAN OF WORKS.

more closely attending the charging and discharging and other retort house operations.

Another alternative was to place duplicate exhausters to each retort house. The disadvantages of this system were great, entailing, as it would, the additional cost of the exhausters and some form of driving them—such as steam generating plant, electric motors, or gas engines—and of six men (three each shift in each house) additional to those already employed. Even then this system presents a potential source of danger, as each exhauster attendant would be working independently of the other, and would naturally be anxious to obtain the greatest possible volume of gas from the retort house, and might, should two houses have a glut of gas at the same time, place such pressure on the purifying plant as to blow seals or to cause one or other of the many petty annoyances possible in such circumstances, and with which my hearers will be well acquainted. This system would also necessitate the equipment of many instruments, gauges, calorific recorders, &c., as it would be imperative for each house to have a complete record of its own volume and quality, so that, in the event of poor gas being made, the blame could be allocated.

The third alternative was to alter the inlet connections from the retort houses in the exhauster house, so as to connect each house to a separate set of exhausters. This system would have removed the available stand-by plants and necessitated the provision of an extra number of smaller exhausters—a policy which was not considered desirable—or, alternatively, a complex system of by-passes permitting any exhauster under sudden emergency to be used for dealing with the gas from one or more retort houses. The latter system, however, was considered dangerous, as it would be complicated, and slow in action in a case of emergency.

### VACUUM CONTROL SYSTEM.

As none of the foregoing alternatives fulfilled our particular requirements, some other form of control had to be devised; and it was decided to adopt the vacuum control system which is now in operation at Wandsworth, and which may be remembered by some of the members of the Association who visited the Wandsworth Works in February of this year. [For an account of this visit, see "JOURNAL" for Feb. 24, p. 466.]

For a year or two the growing necessity for this control had

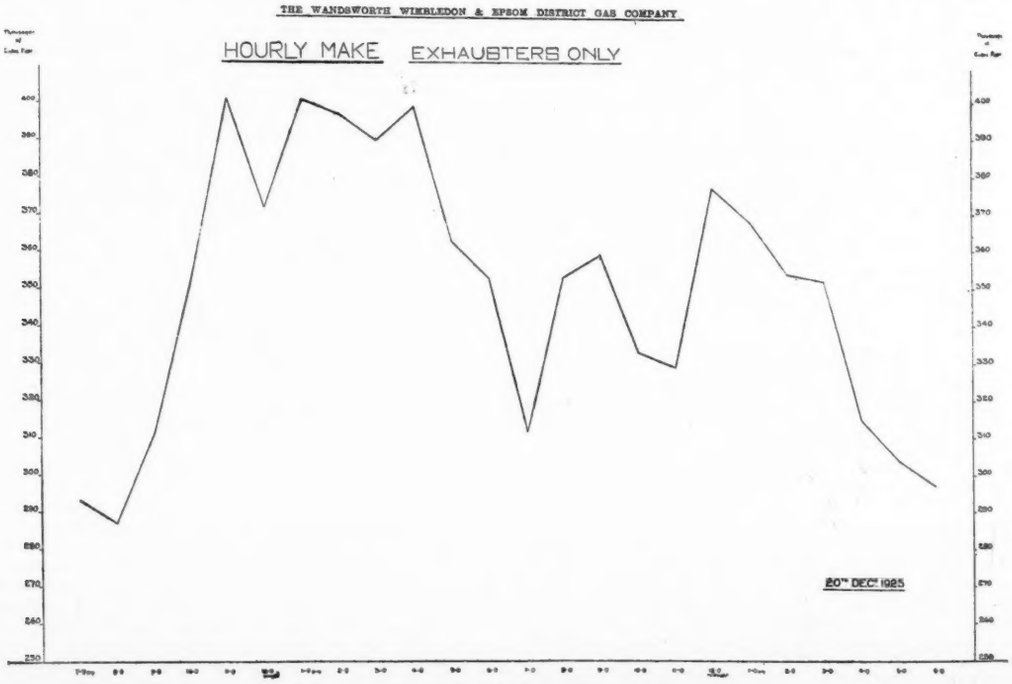


FIG. 2.—HOURLY MAKES, EXHAUSTERS ONLY.

become more and more apparent, and opportunities had been taken during the previous two years of obtaining details, and of inspecting, where possible, any form of governor which seemed to fulfil the required functions. Such a governor had to be extremely sensitive to variations in vacuum or pressure, capable of constant use and easy adjustment, and powerful, but at the same time not sensitive to extraneous interferences.

Since 1919 several types of governors, both British and foreign, were submitted for consideration by various firms; and finally Mr. Harry Donkin, of Messrs. Bryan Donkin Company, Ltd., who had taken a special interest in this matter, suggested the type of governor which has now been adopted. This regulator is known as the "Arca," and is now manufactured in Great Britain by Messrs. Belliss & Morcom, Ltd., for British Arca Regulators, Ltd.

### Construction of Control Station.

Once having decided upon the form of regulator, the design of the vacuum control station was proceeded with. A site was selected immediately opposite the existing exhauster house, ex-

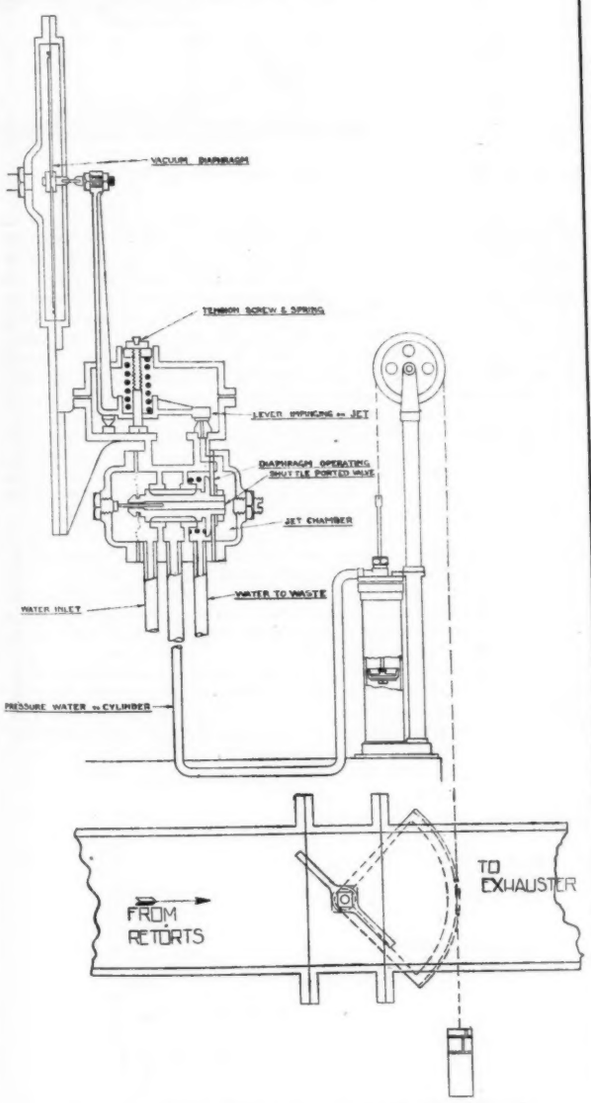


**Fig. 3.—Hydraulic Pressure Cylinder and Relay Control.**

cavations were made, and a large collecting box (fig. 3A) (16 ft. long by 4 ft. wide by 4 ft. deep, the cast-iron plates being 4 ft. square), was built. The design was such that all side plates and end plates were capable of taking 24-in. main connections. The bottom of this box is laid with concrete, giving a slight fall to one corner, for drainage of tar and liquor. This drainage is passed through a self-acting seal of the ordinary type. The side facing the exhauster house was connected into the common exhauster inlet main. Immediately on the plates of the box on the inlet side, four rack valves were fitted. To one of these valves was connected the 24-in. outlet main from No. 3 retort house, with a butterfly valve placed next to the valve. The other valves were left shut pending the necessary alterations to the mains of No. 2 and No. 4 retort houses respectively. The alterations taking place in the summer, No. 3 retort house was the only one at work. Thus, by opening this valve and the exhauster inlet valve, this house was operated, as before, directly to the exhausters, but through the receiving box. The necessary alterations to separate No. 4 retort house from No. 2 were then made. The condenser along the western side of No. 2 retort house was still utilized as a condenser for the gas made in No. 4 retort house, and No. 2 retort house was therefore deprived of sufficient condensing area. To overcome this, and to simplify the connections to the vacuum control station, an overhead main was laid on trestles from No. 2 retort house direct to the vacuum control box, while the main from No. 4 retort house was diverted, and an atmospheric condenser fixed on the side of this house. This series of alterations ensured that each house had its own separate connection to the inlet of the box of the vacuum control station. As the valves were already fixed on the side of the collecting box, the connections to No. 4 and No. 2 retort houses could be made without further interference with gas making. Similar butterfly valves were fitted immediately prior to the valves on the inlet box for the other two mains. These butterfly valves are the actual governor valves and are operated by the "Arca" apparatus as described hereafter.

### The "Arca" Regulator.

The "Arca" regulator consists of two portions, the hydraulic pressure cylinder and the relay control. As will be seen from fig. 3, the pressure cylinder has a single-acting piston of long stroke connected by a wire rope to a quadrant fixed on the spindle of the butterfly valve. A counterbalance weight is fixed on the quadrant, the duty of which is to keep the rope taut and ensure the return of the valve as the pressure cylinder empties. These pressure cylinders are fitted on the working platform of the control house, immediately over the butterfly valves. In working, the slightest movement of the piston in the pressure cylinder causes a correspondingly similar movement of the butterfly valve. The water supply for working the "Arca" apparatus should be of a pressure not less than 15 lbs. per sq. in. At Wandsworth it is stored in a tank fixed at a suitable height, the supply to which is regulated by an ordinary ball valve. Prior to its admission to the apparatus, the water is passed through gravel filters, to remove any solid matter.

### Relay Control.

The relay control operates the admission of water to, and drainage from, the hydraulic pressure cylinder. This relay device contains an "impulse receiver" connected by a pivoted lever (tension-spring controlled) to a rubber diaphragm, the movement, or "breathing," of which varies with the vacuum of the retort house. One end of this pivoted lever impinges on a small jet of water, and its movement is arranged to suppress more or less the free flow of water from the jet, thus causing a difference of pressure in the pipe or chamber which supplies the jet. This pressure difference is multiplied on a diaphragm directly connected to a small pilot shuttle valve. The function of this valve, which has suitable ports, is to permit water under pressure to flow to the pressure cylinder, to allow water to drain from the cylinder, or to maintain a steady pressure in it. The sensitiveness of the "impulse receiver" is exceedingly great, and the smallest movement of the vacuum diaphragm will give a movement of the pilot valve and a corresponding movement of the pressure piston and butterfly governor valve.

The mode of operation is as follows: If the diaphragm remains steady, the water flows straight through the ports of the shuttle valve to waste, and is non-operative. Should, however, the vacuum on the retort house be disturbed—increased or decreased—this shuttle valve moves, and the ports either admit water to the hydraulic ram or release water, thus operating the piston, which, in turn, moves the butterfly valve in the required direction. The flow of water required to operate the "Arca" regulator is negligible, and runs away to a holder tank. The hydraulic ram is so powerful that a man standing on the quadrant or counterbalance weight does not affect its movement. These regulators adjust themselves for volume without manual manipulation, and, if left unattended, would maintain a constant vacuum at any given point. In retort house working, however, the vacuum requires to be varied in accordance with the volume and the quality of the gas being made. The adjustment thus necessitated is obtained by the vacuum control operator by a very slight movement of a little key fitted to the relay valve, and is similar in action to the winding of a clock; the limit of movement being only a small portion of a revolution.

As I have said, we consider it useless for any type of retort house control to regulate the volume irrespective of quality. Therefore, three small exhausters are fitted in the basement of the vacuum control station. The inlets of these exhausters are connected directly to the foul main of each retort house, and a sample stream of gas is continuously drawn immediately the gas is generated. The service from the outlet of the exhauster is laid at an angle as a condenser; the condensates flowing back to the box. These exhausters are placed in a battery—one being available for each retort house—and are separately driven from a countershaft. The outlets from the exhausters are fitted to Carr-Nairne jet calorimeters; this type of calorimeter being provided with a small oxide purifier which, by the use of two unions, can be easily and quickly changed by the attendant.

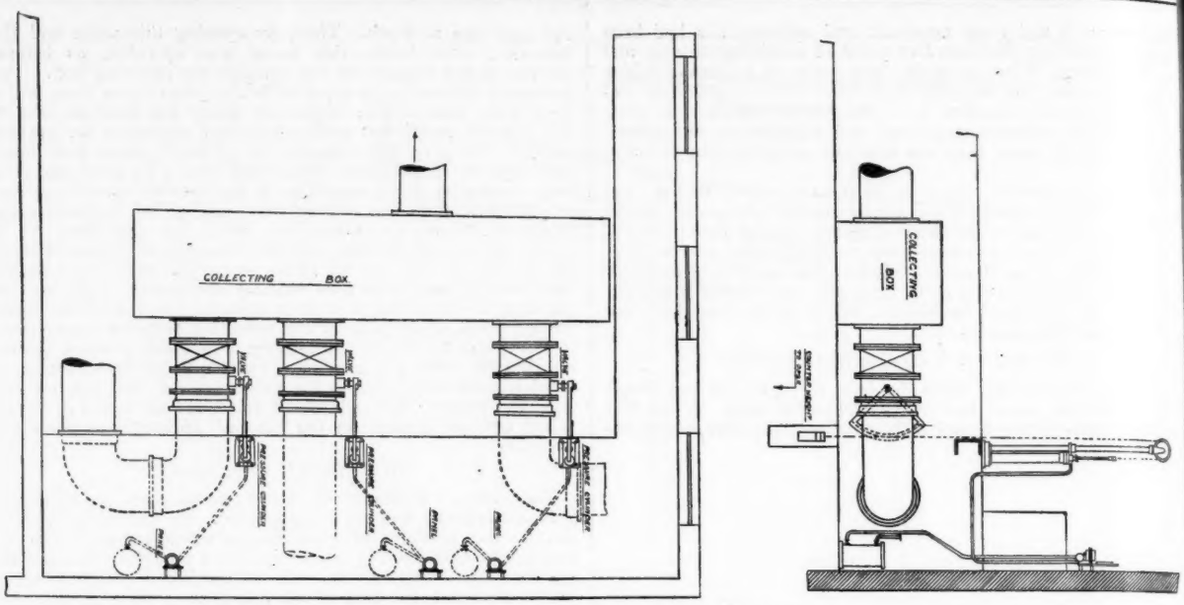


FIG. 3a.—GENERAL ARRANGEMENT OF COLLECTING BOX, BUTTERFLY VALVES, AND CONNECTIONS.

The instrument board is divided into panels; each panel providing a complete unit for testing and control of its appropriate retort house.

### CALORIFIC VALUE.

The exact calorific value of the gas from any retort house is thus observed within a few minutes after the gas has left the retorts; and the exhaust pull on that house can be regulated by the "Arca" apparatus to *maintain a constant calorific value*. To enable the operator in the control room to maintain the required vacuum, a 1-in. service pipe is laid from the hydraulic main of each retort house to the control house, where on each service pipe is fitted a dead-beat vacuum indicator which is clearly visible to the operator when he is standing near the controls, and also a recording vacuum gauge which gives a 24 hours' record for reference purposes. From the collecting box a pipe is run to a clearly visible vacuum indicator which shows the amount of vacuum created by the exhausters within the box; and on this pipe is fitted a vacuum recorder for reference purposes. From the outlet of the main exhausters a pipe is run to the control room, where a pressure gauge is fitted to indicate the total back pressure thrown by the scrubbers, purifiers, and holders, and to guard against blowing seals, &c. To verify the working of the jet calorimeters, a recording water-flow calorimeter is connected by a pipe to the main outlet of the station meters; and the average quality of the mixed gases from the retort houses, after purification, is recorded. The records obtained on this instrument prove that a level quality of gas can be obtained of the desired standard value. Any slight variations in quality at this stage practically disappear by mixing in the holders. A standard Boys calorimeter is provided in the control house, for testing the gas from various parts of the works. The gas supplied to each jet calorimeter and to the recording water-flow calorimeter can be turned on to the Boys calorimeter, and each instrument may be calibrated and checked from time to time. Supply pipes from each gasholder outlet are also connected to this Boys calorimeter; and the gas leaving any holder may thus be tested.

As a routine practice, the town gas is continuously tested in the valve room as it is supplied to the district; but, as is often the case, the outlets of several holders may be open to the district at the same time. Therefore, the Boys calorimeter, which may be connected to any holder separately, gives an opportunity of testing the gas supplied by each holder, and checks any variation in the quality of the gas which may be due to storage. In addition to the above, carburetted water gas is tested on this instrument, and its quality maintained at the same standard as the coal gas, so that there shall be no fluctuations due to varying percentage of admixture through clinkering periods or other causes.

Finally, there is installed a battery of sulphuretted hydrogen testing sets containing lead acetate papers, continuously in operation on the gas leaving the works purifiers and each gasholder. From the above, it will be seen that the gas from each

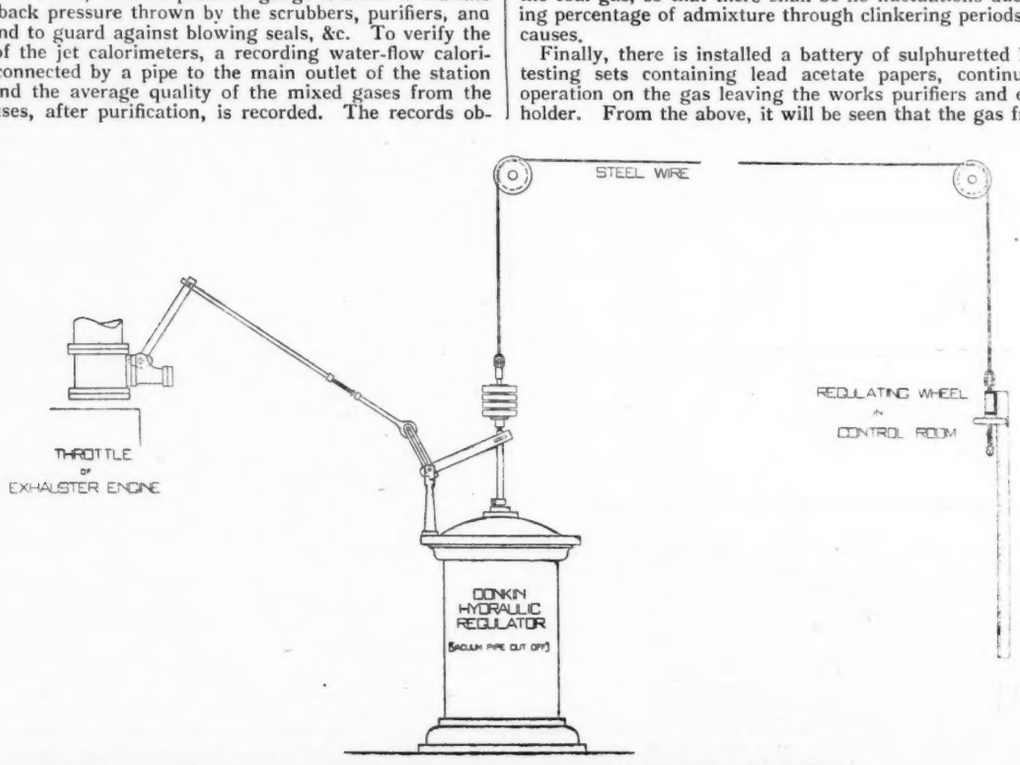
STEEL WIRE
REGULATING WHEEL IN CONTROL ROOM
THROTTLE OF EXHAUSTER ENGINE
DONKIN HYDRAULIC REGULATOR
DIAGRAM SHEWING ARRANGEMENT OF EXHAUSTER CONTROL

FIG. 4.—STEAM CONTROL ARRANGEMENT.

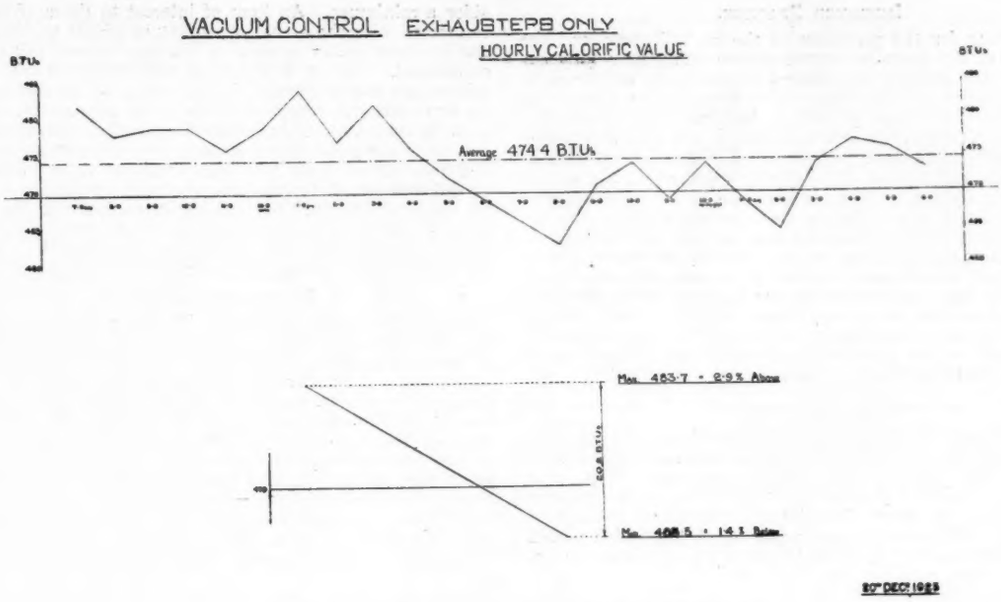


FIG. 5.—VACUUM CONTROL, EXHAUSTERS ONLY.

retort house can be maintained at practically constant calorific power by means of the exhausters and "Arca" regulators, which are easily regulated by the operator to allow for widely varying volumes of gas and for the different distances of the houses from the point of control, and other factors.

### VALUE OF CONSTANT CALORIFIC POWER.

It has been found that, if the calorific power of the gas is maintained practically constant at the standard value from each retort house during the whole of the 24 hours, more therms per ton are obtained than when the quality is sometimes above and sometimes below, though giving an average equal to, the standard calorific power. Variations in calorific power are also accompanied by other undesirable effects. For instance, the percentage of inerts is usually larger than with level working, and it is not always possible properly to mix the qualities in the holders, so that variations then occur in the quality supplied to the district. Moreover, variations in quality mean undue variations in the volume and the rate of passage of the gas through the purifying plant, where level time contact is essential.

As one common pull is now required on the receiving chamber, it is unnecessary and undesirable that each exhauster engine should be separately governed. The Donkin hydraulic regulators, as such, were therefore put out of action, but the throttle valves were kept in use. A flexible steel wire was connected to the top of the spindle of each regulator, and the wires were led over suitable pulleys from the exhauster house to the control room. There they terminate on screwed spindles with hand-wheels. These are fixed in a steel channel in such a way that turning the hand wheels either opens or closes the throttles. The bell and spindle of each hydraulic regulator is thus retained as a balance; and stops can be arranged on the spindles to prevent the engine speed being varied too greatly—*i.e.*, actually stopped, or given too great a speed from the control room. This arrangement gives the control room attendant complete command of the exhauster pull. The arrangement is shown in diagrammatic form in fig. 4.

### MEASUREMENT OF VOLUME.

It will be realized that this control room at present functions for the control of vacuum and quality; but it is intended that the volume of the gas from each retort house shall be measured, and a type of meter suitable for this purpose is being sought. The meters that have at present come to our notice do not appear to fulfil entirely the requirements, as it will be realized that the amount of gas passing through each main varies from time to time when the full retort house is working, and that when part of the retort house is shut down during the summer, or for repair, the quantity of gas fluctuates considerably in comparison with the maximum capacity of the meters, thus preventing accurate registration.

Another ideal at which we are aiming is so to co-ordinate the calorimeters and regulators that they will be automatically corrective for quality. Owing to the delicacy of the process, no success has yet been obtained; but we hope that experiments will eventually lead to success.

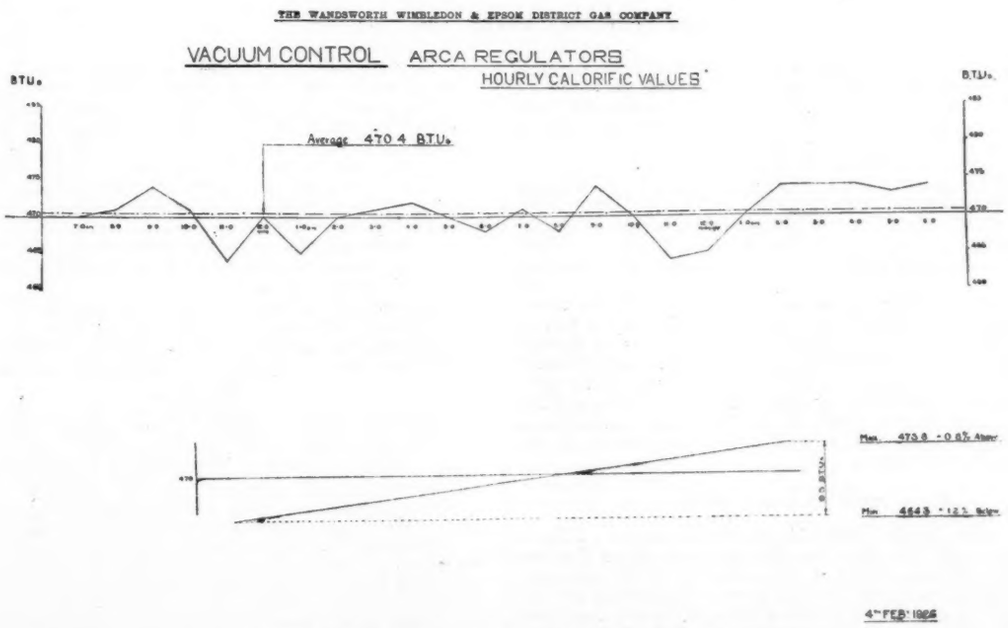
THE WANDSWORTH WIMBLEDON & EPSOM DISTRICT GAS COMPANY
VACUUM CONTROL ARCA REGULATORS
HOURLY CALORIFIC VALUES
BTUs
Average 470 4 BTUs
Max 473·6 + 0·8% Above
Min 464·3 - 1·2% Below
4TH FEB 1926

FIG. 6.—VACUUM CONTROL, ARCA REGULATORS.

### IMPROVED PRACTICE.

The reasons for the provision of the control room and the description of the vacuum control system being now fully explained, it may interest my hearers to give some details as to the improved practice that this system has brought about. In the first place, it should be noted that the declared calorific value of this Company is 470 B.Th.U., gross, and that water gas is manufactured on a yearly average of about 15 p.ct. in normal times, and always of a calorific value equal to the coal gas. Thus a sudden increase or decrease in the percentage of water gas (which is avoided as much as possible in ordinary routine) does not affect either the consumer or the working of the retort houses. In other words, carburetted water gas in this Company is not used in any way as a diluent. Each variety of gas has to stand on its own footing; and both varieties must, therefore, be of the same calorific value. Therefore, in giving the following figures, it has not been necessary to give details of the percentage of water gas, though in all cases it may be taken that the average does not exceed 15 p.ct.

### WORKING RESULTS.

Since the operation of the vacuum control house, the gas has most decidedly been of a more constant quality and composition, as regards both calorific value and inert content. Fig. 5 is taken from a typical day prior to the operation of the vacuum control station. It shows that the gas was of an average of 474 B.Th.U. This average was made up of gas which varied from a maximum of 483·7 B.Th.U., or 2·9 p.ct. above the declared value, to a minimum of 463·5 B.Th.U., or 1·4 p.ct. below the declared value. It also shows how the quality of the gas varied when the "gluts" and "slumps" came over from the retort house in response to the charging operations. Fig. 6 indicates a typical day after the vacuum control station had been put into operation. The gas made on that day was an average of 470·4 B.Th.U., or 0·085 p.ct. above the declared value. The maximum calorific value of the day was 473·8 B.Th.U., or 0·8 p.ct. above the declared value, with a minimum of 464·3 B.Th.U., or 1·2 p.ct. below the declared value. These days are not specially selected, but are average days taken at random.

Fig. 2 shows a chart of the hourly makes from the retort houses prior to the control and, in fact, on the day of fig. 5. The next chart, fig. 7, gives the hourly make of gas on the day shown in fig. 6, from which it will be seen that no improvement in quality can be taken from the hourly make, which was varying from hour to hour in both cases. This shows the capability of the vacuum control plant to deal with any variation in quality, with a capacity to control quality irrespective of any variation in hourly make.

### INCREASED MOUTHPIECE MAKE.

Another effect is the increased mouthpiece make. This is most marked; and therefore less plant is required for the production of a given quantity of gas. Another most important feature is that at no point is undue pressure present in any retort, and the deposition of retort carbon, or scurf, has been considerably reduced—in fact, it has now reached what we consider a minimum. An item of interest to those of my hearers connected with the actual manufacture of gas would have been the increases in the amount of therms obtained per ton of coal carbonized. Owing, however, to the disastrous coal stoppage, which has lasted during the greater part of this year, and, in fact, the greater part of the time the control house has been in operation, it is impossible to give comparisons. The quality of the gas has had to be altered to meet the emergency, and coal of all sorts has been obtained from sundry places spread over the globe, and has varied in its quality as it has in its source of origin. No reliable or comparable figures could therefore be given at this stage; but from nearly a year's working we are satisfied that the system has proved of undoubted advantage and improvement to the Company's practice.

### EFFECT OF PEAK LOADS.

During the year there occurs in all gas-works a time when the rate of manufacture of gas has to be suddenly accelerated to meet cold snaps, foggy days, and other emergencies; and consequently a greater pressure is thrown upon the purifying plant during the rush periods. These sudden emergencies, occurring as they do generally in the winter, when the plant is working at or near its maximum capacity, are apt to cause anxiety by throwing greatly increased back pressure at the outlet of the exhausters. As a method of partially overcoming these difficulties, a booster has been fixed at Wandsworth on the line of connection from the outlet of the station meters to the inlet of the holders. This booster is of 500,000 c.ft. per hour capacity, direct-coupled to an electric motor. The starter and regulator of this booster is placed in such a position as to be under the control of the vacuum control attendant, who, as already explained, has a recording pressure gauge showing the total works pressure. When the total works back-pressure arrives at a pre-determined point, this booster is started, and can be controlled at such a speed as partially or practically wholly to remove the pressure necessary to lift the holders. Thus all the plant after the outlet of the exhausters is relieved by a corresponding amount of pressure.

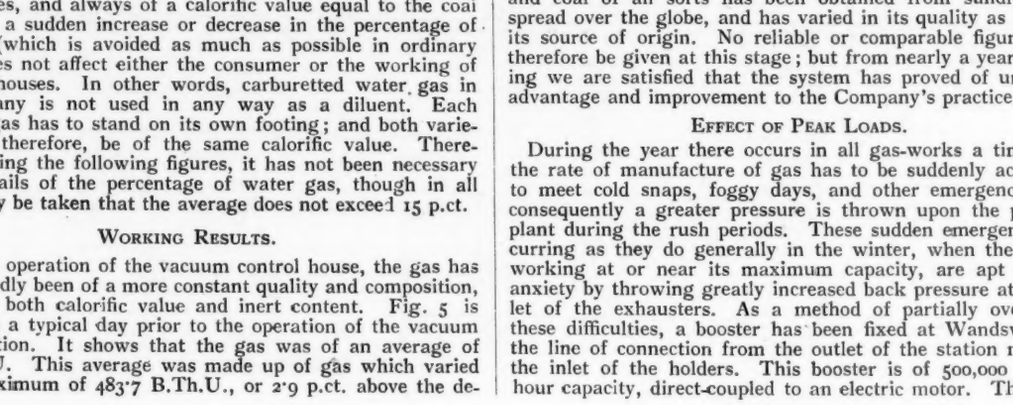


FIG. 7.—HOURLY MAKES, ARC CONTROL.

At a maximum, the booster is worked at such a speed as to reduce the pressure on the outlet of the meters to not less than two-tenths water pressure.

To prevent any sudden stoppage of the passage of gas, due to the accidental failure of the booster at any time, an automatically operated by-pass valve is fitted, which, with the slowing-down of the booster, opens, and allows a free passage of gas.

### Discussion.

The PRESIDENT said all would agree that the exposition they had had of the ingenious developments at Wandsworth would prove extremely useful. They were particularly grateful to Mr. Croft for the interest he had manifested in the Association by coming and giving them so admirable an address. They were all aware that Wandsworth was supplied with cheap gas; and that night there had been given to them some indication of the efforts that had been made to get costs down to the lowest possible figure, by the development of this system of control of the output from the retort houses. As a distribution man, he (the President) could say how much they appreciated a constant calorific value. The fact that at Wandsworth it was found possible to keep the calorific value so constant must have a very good effect upon their manufacturing costs.

Mr. SYDNEY G. MARTLEW asked whether Mr. Croft could give some indication of the cost of the equipment.

### THE QUESTION OF SHIFTS.

Mr. LEONARD LACEY remarked that doubtless most of those members who were engaged on the works had had experience of working twelve-hour charges with two eight-hour shifts, and had come up against some difficulties. One of these was the early hour in the morning at which some of the men had to start work. Another difficulty was that for four hours after each shift the retort houses were left practically unattended. Was the author troubled with blocked retorts? In his own experience there had been some such cases. All present must have been struck with the ingenious arrangements adopted at Wandsworth for regulating the quality of the gas from the various retort houses. He noticed that the author discussed the question of retort house governors, and decided against their use as the sole means of controlling the quality of the gas; but it would have seemed to him (Mr. Lacey) that, although there was a regulated vacuum on the outlet of the retort house, it would still be necessary to maintain, in the case of a retort house of any considerable size, constant conditions from one end of the house to the other, and that for this purpose, in addition to the scheme outlined, it would be requisite for some retort house governors to be used. Had the author any retort house governors at all, or were the mains so big that the vacuum could be maintained throughout? He thought that the practice at Wandsworth of working with 15 p.ct. of water gas only, and that of the same calorific value as the coal gas, was, if not unique, at any rate very unusual. He quite agreed with the desirability of aiming at that ideal to which the author had referred in the latter part of his paper—namely, so to co-ordinate the calorimeters and regulators that they would be automatically corrective for quality. It would be interesting to know what progress had been made in this direction. He would also be glad to hear whether Mr. Croft was able to maintain his contention that the output in therms per ton was increased by the system now in operation. The paper was one of great value. Apart from the actual description of the "Arca" regulator, the author's account of the problems in connection with the different retort houses, and of the conditions to which they had had to adapt themselves, was highly instructive.

### RETORT HOUSE GOVERNORS.

Mr. W. T. KENSHOLE (Lea Bridge) remarked that, in discussing vacuum control, Mr. Croft had dealt with a subject which was dear to the heart of carbonizing engineers. He spoke very well indeed of the "Arca" regulator; and it would seem that if they all had this device installed, they would be saved a lot of walking about. The advantages of a good, reliable system of vacuum control were obvious to everyone. It was only on such a basis that one could hope to obtain the highest yield with a low inert content and constant composition gas. Those of them who had been privileged to see the apparatus at Wandsworth probably afterwards thought a good deal about it; and he, for one, came to the conclusion that he did not like it. One reason for this was that he had always thought of his ideal large retort house as one in which there would be a retort house governor to about every four or five beds; these governors being so arranged that alterations could be made without having to go to the top of the bench. He must say, however, that what Mr. Croft had put forward towards the end of his paper had greatly impressed him with the manner in which the apparatus had performed its work. He would like to ask Mr. Croft whether his retorts were fitted with one or two ascension pipes. Vacuum control entered in largely where one had 20 or 22 ft. retorts and only one ascension pipe. It was a question of the degradation of the gas. Of course, with only one ascension pipe, there was only this one to look after, and perhaps money might be saved in that way; but personally he thought that a very good case could be made out for two ascension pipes.

Mr. R. E. GIBBINS (Tottenham) asked what was the inert percentage of the gas under this process.

Mr. E. ROWLAND WILLIS alluded to the varying distances of the retort houses from the control room, and inquired what lag there was in the pipe that took the gas from the houses to the jet calorimeters. He thought the author had been rather fortunate in being able to maintain a fairly constant percentage of water gas. Many of them had very fluctuating loads, and were compelled to pick up and drop their water gas plants at extremely short notice.

### TWO-SHIFT AND THREE-SHIFT WORKING.

Mr. WALTER GROGONO (Fulham) said he had listened to the paper with great interest; but he looked at the matter from the point of view of the policy that was underlying it—namely, two-shift working, with a four-hour gap. Was Mr. Croft absolutely satisfied that two-shift working was better than ordinary three-shift working? The advantages he knew of were slightly reduced labour costs and four hours for repair work in between. The disadvantages were the ones the author had evidently run into—variation of calorific power and volume of gas, and its attendant worries. It was necessary to put down plant to take the maximum hour's make, which with two-shift work was a very high peak. Then, the house had to be designed so that the machine was capable of charging the whole of the retorts in it in eight hours; whereas if it was doing three-shift work, and twelve-hour charges, the house could be large enough for the machine to do only two-thirds of it in eight hours. Another question was whether there was a reduced output from the house due to the two-shift, as compared with the three-shift, working. Some years ago he, the speaker, had under his control a house which had a governor to every two beds; and this house was practically unworkable, from the amount of attention that had to be given to these governors. It had 44 settings in four beds. When the arrangement was altered, and a governor put on each section, everything became quite quiet. He rather gathered that the author had retort house governors at work as well. He did not say whether he was working with dry mains or seals, or with single or continuous hydraulic mains. There was also the question of feeding and clinkering furnaces. Were the furnaces left entirely alone during the four-hour gap; and, if so, what was the difference in the producer gas at the beginning and end of the period, and how did it affect the heats?

Mr. E. C. NASH (South Metropolitan Gas Company) remarked that the paper described mass vacuum control. He could foresee a time when it would be necessary to rebuild settings so controlled; and if the retort houses were large, it might not be possible to renew the whole of the settings in one year, in which case they would for a time be working one half with new settings and the other half with old ones. Under these conditions, it seemed to him that it would be impossible to get the maximum efficiency from the new settings if they were put on the same control as the old.

Mr. E. E. CALVERT (Gas Light and Coke Company) expressed surprise that the author made such a low-quality coal gas as 475 B.Th.U. Under the conditions outlined in the paper, he must at one period get off very high calorific power gas; and, in order to bring this down to 475 B.Th.U., he must put on a tremendous vacuum, with the usual effect upon the proportion of inerts. Had the author been able, under the "Arca" system, to maintain his quality during the coal troubles of the past six months, which must have been a very good test of this unique method of retort house control? The experience he had had would be of great benefit to others. Perhaps the author would tell them how the make of the house with the two-shift system compared with that when working three shifts.

### VACUUM AND MAXIMUM MAKE.

Mr. J. H. GOLDSMITH (Hon. Secretary) said he would like to know the vacuum that was reached in the retorts when the maximum make was coming off. There must be a high degree of vacuum in the retorts just after charging, if the gas was to be pulled down to 475 B.Th.U. It looked as though the inerts might be expected to be rather high, through pulling in air or furnace gases. He was in agreement with the desirability of metering the gas stream from each retort house, and would be glad to hear whether the author had found a satisfactory meter which would cheaply do this. Co-ordination of the calorimeters and the regulators, so that one could get autmatic control of the calorific value, was a very desirable end to aim at; and probably in the near future such a thing would be possible. There was a calorimeter on the market at present which lent itself particularly to the automatic control of an instrument like the "Arca" regulator; but he had never heard of its being so used. Had any difference been found between the calorific value figures of the three streams of gas separately and of the mixed gas afterwards? The use of a small exhauster for drawing samples from each retort house make was interesting. Had Mr. Croft experienced any difficulty with tar in the calorimeters—seeing that he had only a small purifier to take out the sulphuretted hydrogen? Did this purifier last a reasonable time, in view of the tar and tar fog likely to go forward?

Mr. BULLWINKLE wondered whether, with the increased draw he had to put on to get the gas away at charging time, the author was of opinion that the inerts might be greater at that time; and, if so, whether this was due to air or furnace gases being pulled in, or whether the retorts and joints were so tight that it was due solely to the cracking-up of the gas.

Mr. M. WALKER (Lea Bridge) asked whether Mr. Croft could give them, in addition to the percentage of inerts in the gas, the average specific gravity, because, though constant calorific value was very desirable, so also was constant specific gravity. The increased pull to get the rich gas down to 470 B.Th.U. must considerably affect the specific gravity.

### MR. CROFT'S REPLIES TO QUESTIONS.

Mr. CROFT, on rising to reply, remarked that the members had given him a good many questions to answer, and he would do his best to deal with them all. With regard to the cost of the equipment, he did not know whether the questioner meant the cost of the new plant or the cost of running it. The cost of installing the plant would depend to a great extent upon circumstances; and it would be difficult to give a definite figure. His own plant required alterations of the mains and other work which would not apply to all cases. However, he thought the cost of the vacuum control station itself was somewhere about £1500. In this the alterations to the mains were not taken into account; the amount was for the instruments, collecting box, and exhausters. As to men commencing work at a very early hour of the morning, it so happened that the great majority of his stokers—at any rate at Wandsworth, where the two-shift system was in operation—lived very near the works; and there had been no trouble whatever on this account. They had not been troubled with blocked retorts; and it was not found that there were any more stopped pipes than under the old system. In fact, there was no trouble whatever from this cause. In the case of sudden emergency during the four hours a retort house was left, the foreman, who was always going about, could easily secure the assistance of men from another house. Retort house governors were not used now. They had been gradually given up, and were completely done away with when the vacuum control system was installed. There were tar towers for every six settings throughout the works. He could unhesitatingly say that there had been no reduction in therms with the twelve-hour charges. The therms per ton increased slightly, because they used somewhat heavier charges. There were now two ascension pipes to each retort throughout the Company—at Wandsworth, Mitcham, and Epsom—and they did not think the gas lost in calorific value through the delay in getting from the retorts. The inerts in the coal gas, on an average, were: $CO_2$, 2·5 p.ct.; O, 0·2 p.ct.; and N, 16 p.ct.—total, 18·7 p.ct.

As to the time lag between the generation of the gas and its reaching the testing instrument, this was estimated at from four to five minutes. The proportion of water gas during the recent strike was, of course, greater than 15 p.ct. When sudden emergencies arose, the amount had to be increased; but under average conditions they maintained the proportion round about the figure he had named.

For the conditions existing at Wandsworth, he should say unhesitatingly that two-shift working was better than three-shift. This was also the case at Epsom. The system had not been adopted at Mitcham, because the retorts were of a different size. It was found that in the two-shift plan there was not only economy, but improved working. They had always at Wandsworth rather under-worked their machines; and they did this because they regarded it as being more economical than having fewer machines over-worked. The practice throughout the Company was to have one charger for every twelve beds. As to whether there was any reduction in output consequent upon the introduction of two-shift working with twelve-hour charges, he had stated in his paper that the charges were slightly heavier. They did not lose anything. In fact, their mouthpiece makes were slightly up. They had single hydraulic mains—two per bench. No difference was found in the heats, consequent upon the method of working adopted. There was never a definite vacuum on the retorts. The charts confirmed his point that the flexibility of the vacuum control station was well able to overcome any difficulties of the periods of glut and diminished gas production. They did not find that the quality of the gas was richer during gluts than at other periods. The tests carried out did not refer to the very difficult period of the coal strike. During that time they were giving a constant 450 B.Th.U. They went down slowly, and recovered slowly also; and the complaints were gratifyingly few in number.

It was their practice to maintain always just a level gauge on the retorts, during all the time, over the whole day. Comparing the make of a house over twenty-four hours with two-shift and three-shift working, he did not think that there was much difference, except that, with the slightly increased mouthpiece make which he had explained in connection with the two-shift working, there was a slightly greater output of the whole house. They could now keep their gases constant all through; and they found the streams from the three retort houses and the finished gas were practically identical in value. The purifiers for the calorimeters were changed about once a week; and they did not get trouble from any tar coming forward. The pipes were laid at a good slant; and most of the tar dropped back to the collecting box. The calorimeters were therefore never out of action from this cause. They did not at any time get an increase in inerts, because the quality of the gas was practically constant, and therefore the inerts were practically constant throughout the period.

The President said he desired personally to thank Mr. Croft for the great trouble he had taken, first in the preparation of his address, and then in coming to deliver it to them.

In response to a hearty vote of thanks from the members—which was accorded on the proposition of Mr. Grogono, seconded by Mr. H. J. Risby (South Metropolitan Gas Company)—Mr. Croft declared that he himself had enjoyed the evening thoroughly.

## SCOTTISH JUNIOR GAS ASSOCIATION.

The Annual Joint Meeting of the Eastern and the Western Districts of the Association was held in Windsor House, Edinburgh, on Saturday, Dec. 11, when an address by Mr. C. B. Tully on "Modern Gas Manufacture," was read by Mr. Oliver E. Yeo, of Newark, Mr. Tully's Assistant, to a large attendance of members.

Mr. Darling (Cowdenbeath), President of the Eastern District, took the chair, and extended to the members of the Western District a cordial welcome to Edinburgh. He said it was a matter for regret that Mr. Tully could not be with them in person.

### MODERN GAS MANUFACTURE.

By C. B. Tully.

Developments are taking place so rapidly in the gas and the chemical industries that what is modern to-day will be obsolete to-morrow. By the study of the reactions and phenomena of gases, discoveries of the greatest importance to the gas industry are being made, and are being applied to the chemical industry. The industrial demand for gas, and particularly for hydrogen for the manufacture of synthetic ammonia and other products, is increasing in all countries, and is likely to provide an enormous field for the energies of future gas engineers.

So far coke oven gas has been used as the basic gas for the manufacture of hydrogen, but, owing to the difficulty of disposing of the coke, attention is now being paid to other means of producing gas without this bye-product; and the complete gasification of coal is receiving a great amount of attention. Schemes are in preparation for many huge plants, some to produce as much as 20 million c.ft. of gas per day, and many to deal with 1000 tons and more of coal per day. This rapid development is largely the result of research work during the war, and of the production of steel and other materials which enabled men like Georges Claude to develop their ideas to the stage of practical commercial use. Steel has already been made which, it is claimed, will revolutionize many processes, and even render possible the gas turbine. It is hard to visualize what effect such a metal will have upon industrial gas processes, but it should render practicable many things which have hitherto been more or less impossible in the ordinary gas-works.

#### Removal of Sulphur from Gas.

I recently had the privilege of investigating a process for the removal, from crude gas or gaseous hydrocarbons, of sulphur compounds which, by poisoning the catalysts, cause so much trouble in catalytic processes. I am not at present at liberty to disclose its details, but in so far as it enables these troublesome sulphur compounds to be removed from hot crude gas, it represents a great advance upon previous methods of purification, and opens up many possibilities. Incidentally the discovery was, like that of calcium carbide and many other discoveries, made accidentally, and was the outcome of work upon a catalytic process for the production of more spirit from crude oil. Naturally the removal of sulphur compounds from hot gas without preliminary condensation interested me very much, as it overcomes a serious difficulty which was experienced when treating Tully gas catalytically for the removal of carbon monoxide and the production of hydrogen for the synthetic ammonia process.

Dr. Carpenter was, we know, the pioneer of the catalytic removal of sulphur from coal gas, but he has found few followers to adopt this important method. The new process, however, is different, as it deals with the hot crude gas direct from the plant, and delivers it as hot sulphur-free gas.

I might mention that the motor spirit process to which I have referred succeeded in converting over 90 p.ct. of the crude oil into spirit—which gives some idea of the possibilities of dealing with liquid hydrocarbons.

#### Bye-Products.

What a modern gas-works should be to-day depends entirely upon the requirements and conditions under which it has to operate, and specially upon the local markets for bye-products. These points have to be carefully considered; and what is right in one district is not necessarily so in another. My past experience, however, is that bye-products are more or less a nightmare to the gas manager, and that to a large extent the success of an undertaking depends upon the finding of profitable markets for them. It is my opinion that many gas companies would do better to confine their energies primarily to the manufacture and sale of gas, and produce the minimum quantity of secondary products possible. At the best of times there are only a few months in the year when there is an appreciable demand for coke—mostly when snow is on the ground. The production of coke in this country cannot be considered a business proposition when it has to be sold for less than the original cost of the coal; and the production of smokeless fuel is too risky a business for any gas concern to undertake on a large scale. To produce a good free-burning fuel of high quality for the local market, where such fuel can be sold at a reasonable price is, however, another matter.

Gas men naturally do all they can to boost their own most important bye-product; but we cannot ignore the fact that good English coal burned in the modern grate is one of the luxuries the Englishman is not likely to give up for patent fuels, or even for the gas fire, except in certain places. Further, unless coke or smokeless fuel is made from expensive or treated coals, the high ash content and consequent dust and dirt cause it to be in disfavour. Then again, there is no doubt that the fumes of sulphur do get into the room to some extent when coke is used in the average open fireplace.

With regard to the calorific value of the gas supply, I am convinced that a gas of about 400 B.Th.U. is in the majority of cases the most satisfactory to supply for all parties concerned, considering the existing state of the bye-product markets, and affairs generally in England. No doubt the coal strike has been the means of stimulating some practical investigation into this matter, and has given the gas manager the opportunity of testing it for himself. In Italy, where I have spent much time lately, gas undertakings have not the opportunity of increasing the price of gas by raising the calorific value of the supply; and in that country the general calorific value is about 4100 calories per cub.m., or about 435 B.Th.U. per c.ft.

#### Low and High C.V. Gas.

There is no doubt whatever that gas of 350 B.Th.U. can be distributed to give general satisfaction, providing it is good gas containing under 10 p.ct. of inerts, and is not "stretched," or a mixture of coal gas and producer gas containing a large percentage of nitrogen. As value for money to the consumer, the qualities cannot be compared. The good gas burns with a short flame, and has a high flame temperature, with the result that the consumer gets the maximum duty out of the gas, whereas with "stretched" gas the flame is long and of low intensity.

A similar thing may be said of very rich gas, for with this it is difficult in ordinary apparatus to get a sufficient injection

of air for proper combustion—which is one of the reasons why recourse has to be made to high-pressure lighting. With 350 B.Th.U. gas, very little air is required, and complete combustion is easily obtained.

Gas undertakings, however, having usually started their existence in the days of the flat-flame burner, when straight rich coal gas had its advantages, have naturally only adopted in slow stages the present lower calorific standards. This has led to many attempts to increase the calorific value of gas obtained by complete gasification—generally by the cracking of the tar—but such attempts have resulted in little advantage, and the results obtained have not justified the trouble and expense occasioned. All endeavours to crack and gasify tar have led to disappointment; and after many years' experience, I am convinced that the only thing to do with tar is to remove it as soon as possible by condensation, and send it to a distillery.

It will possibly be of interest to consider what the late Prof. V. B. Lewes had to say on this subject in his valuable, and perhaps too little known, work "Liquid and Gaseous Fuels." Describing a plant, he mentioned that "the nascent tar vapours never had the chance of condensing into the vesicular form found in the brown tar vapours leaving the retort. It was superheated, instead of being cooled, and bore the same relation to brown tar vapour that superheated steam does to the condensing steam we see leaving the spout of a kettle. Catch it in this nascent state, and heat will gasify it; but if it once cools to brown vapour, molecular condensation prevents it ever again being got in the gaseous state without almost complete decomposition. The tar must pass direct from the coal into a temperature higher than that which gave it birth, but not hot enough to do more than gasify it; and if any important results are to be obtained from tar as a gas producer, it will be on these lines."

This and the other works of Prof. Lewes are well worth careful reading. The success of the Tully plant is almost entirely due to his teaching in the past, when I had the benefit of his co-operation.

In the Tully plant, the fuel bed is constantly fed with hot coke from the superimposed vertical retort; and as a consequence the water gas leaves the lower zone and enters the retort at a high temperature, with the result that the coal in the retort is carbonized in an atmosphere of water gas at a higher temperature than the coal. I think it will be apparent from this that the axiom of Prof. Lewes is attained; for the instant the tar vapours leave the coal, they are immersed in the higher temperature of the water gas passing through the fuel. That a fair proportion of the tar is so gasified is, I think, evidenced by the fact that, notwithstanding the low temperature at which carbonization is carried out, the tar produced per ton of coal is less than would be expected from a consideration of temperature alone. It is not improbable, also, that a catalytic action takes place to some extent in the retort, for ash is usually carried forward by water gas, and this ash is to a large extent filtered out by the coal in the retort. That the presence of ash has a marked effect upon the gas produced is an accepted fact. The adding of suitable catalytic substances to the coal fed to the generator might well form the subject of useful investigation, and lead to the production of gas of a higher quality.

### Increasing the C.V.

The normal economical gas which can at present be produced in the Tully plant is one of 350 to 360 B.Th.U., varying according to the quality of coal used. It is possible, however, to increase this value in several ways, as follows.

(*a*) By withdrawing as much carbon as possible from the generator when clinkering, and using it as fuel for steam raising. The best method is to shake up the fire every three or four hours, and remove all dust before much clinker has had time to form. This takes but a few minutes, and to a great extent reduces the heavier work of clinkering. Of course, the more carbon removed from the generator bottom, the less water gas is produced per ton of fuel, and so the richer is the mixed gas produced.

(*b*) By installing a waste-heat b iler, and over-blowing the plant, so producing a larger quantity of blow gases, to be utilized in raising steam. The blow in such cases is reduced in volume but extended in time, which gives a richer blow gas and requires more secondary air for combustion either in or before reaching the boiler flues.

(*c*) By withdrawing some of the water gas before it enters the retort, and using it under boilers or in engines for the production of steam, power, or electricity.

(*d*) Another method has been put forward for the same purpose. This consists of making the generator a producer of gas and smokeless fuel; but a study of the theory of water gas production will, I think, suffice to show that such a proposal is not practical.

(*e*) An alternative is to withdraw a portion of the water gas before it enters the retort, and pass this through an oil carburetter, where it can be enriched in the usual manner. By this process a mixture of rich coal and water gas is obtained at the top outlet of the generator, and an oil-enriched gas is obtained from the outlet of the carburetter; the two being collected in a common seal box if it is desired to mix them.

These several methods of obtaining a richer gas than 350 to 360 B.Th.U. all depend more or less upon the fact that the sensible heat of the water gas produced by the complete gasification method is more than sufficient for the carbonization of the coal fed to the generator. From results obtained, it has been estimated that the sensible heat of some 20,000 c.ft. of water gas at the temperature at which it leaves the producer zone is sufficient for the carbonization of one ton of coal. This volume is only about one-half of the water gas which the coke resulting from the carbonization of one ton of coal is capable of producing. Consequently, apart from the heating of the retort externally by the combustion of the blow gases in the checker work, the possibility exists of drawing carbon from the producer, or water gas before it enters the retort, and still maintaining effective carbonization of the coal charge. Tully gas being a mixture of water gas and coal gas, it follows that the less the water gas content, the richer will be the mixture.

### Waste-Heat Boilers.

In all gas plants there is necessarily more or less waste heat which can be recovered in some way; but the amount of waste heat which can be recovered from a particular plant is not a testimonial to its efficiency. In the old days of well-designed regenerative settings, gas managers prided themselves upon the low temperature of the waste gas flues; and in most industrial works using solid or gaseous fuel we find the same thing to-day—records being systematically kept of flue temperatures and of the composition of the waste gases. It provides food for thought when one hears to-day of schemes for running large power units from the waste heat of the local gas-works' retort house. Where genuine waste heat exists, recover it by all means; but it is doubtful progress to instal waste-heat boilers, and then set about producing sufficient waste heat to make them work.

With a Tully plant there is less waste heat than with the ordinary water gas plant, and what there is could be better used in superheating; but conditions do exist where a waste-heat boiler has its advantages, especially where a carburetter is added. Usually it is an advantage to couple such boilers up to the main works boiler, owing to the intermittent heating, and consequent tendency to pressure variations.

In passing, it might be as well to refer to the general running of the boiler house. In the past this was too often considered a convenient dump for breeze and surplus coke, with the result that a great waste of steam and fuel took place, with but little effort to economize. To-day it is a different matter, and more attention is being paid to the fuel used for steam raising, though in many works there is still plenty of room for economy. It is a comparatively simple matter to meter the water feed to the boiler, and to weigh or gauge the fuel used. Daily records of these enable the boiler efficiency to be estimated, and a check kept on the steam consumption of the various parts of the plant.

### Development.

The original of the present Tully plant was constructed over twenty-five years ago, and was intended for the gasification of coke and tar for the production of what was then known as methane hydrogen gas. Two of these plants are still in existence, one at the Great Western Railway Works, at Swindon, and another at Doncaster, which is the plant originally put up at Truro—the first of its kind. Coal was used in these plants occasionally in the early days, but the complete gasification of coal, as now carried out, was a creation of the war. Due to the need for coal economy, and for other reasons, the plants were much in demand at the close of the war, and they had to be installed as quickly as they could be built—in fact, before the process had been properly developed. It was a matter of improving the process as the plants were built.

With makeshift materials and somewhat inexperienced labour, many difficulties were met with; but notwithstanding this, the plants proved their value. Several of them saved their cost in less than one year, and others prevented works from closing down. This pioneer work has provided the data on which the present plant is designed; and the experience gained in a few years (unfortunately at a heavy capital loss) would otherwise have taken a much longer period to acquire. It is now possible to obtain a much larger output and greater all-round efficiency from a given generator. The removal of the rich gas from the top of the retort during the blow, by means of a small water-sealed by-pass pipe, increases the calorific value of the gas somewhat, and reduces the smoke, which occasionally gave a little trouble at the snift. About 12 to 16 gallons of good thin tar is obtained per ton of coal gasified, and the ammonia yield is high.

Mechanical operators have been added to the plant in some cases, and these are of simple design. They reduce the constant attention otherwise necessary on the part of the operator, and at the same time increase the general efficiency of the plants, owing to the accurate timing of the duration of the run and blow periods.

### Revolving Grates.

After many trials, a mechanical grate has been produced which gives every satisfaction and enables low-grade fuels to

be used with economy. The grates save the heavy work of clinkering, and, owing to the uniform conditions produced in the generator, add to the output of gas, and maintain a more uniform quality.

I trust that in reading this paper to you I have in some measure assisted you to realize at least a few of the possibilities there are in store for those who wish to take up the study of their profession on modern lines. Forty years ago I thought I had a fair knowledge of gas engineering, and since then I have lost no opportunity for study; but to-day I find there is more to investigate and more problems than ever to overcome. New schemes and processes for dealing with solid, liquid, and gaseous fuels are continually being proposed and commenced, and it is safe to say that each presents to those responsible its batch of problems, the solution of which reacts upon the older-established methods and processes. The tendency for each civilized country to strive to become independent of other countries for the supply of its fuel requirements will inevitably produce new methods and industries; and in England, where the basic fuel is coal, important developments may well be expected.

**Discussion.**

Mr. GRAHAM (Vice-President of the Western District) said that their experience in the West was that sufficient coke could not be supplied for industrial purposes, and as for gas fires, these were being fitted in abundance. Mr. Graham asked that the hearty appreciation of the members be conveyed to Mr. Tully for his interesting paper.

Mr. G. RICHMOND (Penicuik) thought that if some figures on the efficiency of the plant had been included, or the cost of the process, the value of the paper would have been raised.

Mr. SHORT (Kelty) said that mention had been made by Mr. Tully of a good thin tar being obtainable. His own perience was that the tar was very thick.

Mr. URQUHART (Tranent) remarked that he was a Tully plant enthusiast. He had found the plant invaluable. During the coal strike in 1921 his Directors had decided to instal a Tully plant; and they had never looked back since. The demand for gas had nearly trebled, in spite of the strong opposition of the Lothians Electricity Company's activities in his own area. During the recent coal trouble, his plant had given him no worries whatever.

Mr. KEILLOR (Greenock) observed that during the coal stoppage most gas engineers did not regard residuals as a nightmare, as Mr. Tully had suggested. They acted as a lever in keeping down the price of gas.

Mr. CAMPBELL (Anstruther) gave a brief appreciation of the Tully plant.

Mr. MACKIE (Kelty) said that the Tully plant was ideal for a small works. He, too, was troubled with a thick tar, however, and would be glad if this could be explained.

Mr. YEO, in reply to the question regarding tar, pointed out that one sometimes found more than tar in the boxes—coal dust, for example.

VOTES OF THANKS.

The CHAIRMAN proposed a vote of thanks to Mr. Tully for the paper, and to Mr. Yeo for reading it to them.

The members then sat down to tea; the Western members being the guests of the Eastern District.

Subsequently Mr. GRAHAM, on behalf of the visitors, thanked the members of the Eastern District for their hospitality.

# SOCIETY OF CHEMICAL INDUSTRY.

## Meeting of the Newcastle Section.

Mr. L. H. Sensicle read an interesting paper at a meeting held at Armstrong College, Newcastle, on Tuesday, Dec. 14, under the auspices of the Newcastle Section of the Society of Chemical Industry. Prof. A. H. V. Briscoe presided, and there was a large attendance, including members of the North of England Gas Managers' Association, and of the Northern Section of the Coke Oven Managers' Association.

### THE FUTURE OF HIGH-TEMPERATURE CARBONIZATION.

By L. H. SENSICLE, B.Sc., F.I.C.

[Extracted.]

Carbonization methods are divided into two categories—high and low temperature. Discussion of the latter would be irrelevant, but it may be said in passing that the view is largely held that, though low-temperature carbonization may have a limited scope for dealing with special coals of, perhaps, a low commercial value in isolated districts, it is not an industry that is going to develop on a wide basis. Indeed, in the field for which it was originally intended—*i.e.*, the production of a solid smokeless household fuel—the process has proved up to the present a commercial failure. The only cases in which commercial practicability has been shown have been in the production of a small fuel, and of large volumes of low-grade gas suitable chiefly for internal-combustion engines. It is conceivable that if the low-temperature process expands appreciably in the future, it will be used for the carbonization of non-coking or poorly coking coals in pulverulent form, or for the special purpose of producing fuel oil.

CARBONIZATION IN BULK.

In the smaller gas undertakings it seems unlikely that great departure from existing carbonizing practice will take place, but in the larger works it is possible that carbonization in bulk will supersede the present methods. Such new methods are becoming customary on the Continent and in America, and represent a close approximation to bye-product coking practice. In this country only one gas concern, the Birmingham undertaking, has partially adopted carbonization in bulk. There they have working a battery of 66 Koppers coke ovens, which have been installed presumably because of the readily available foundry coke market in the immediate vicinity.

A notable instance of the adoption of coke-oven practice in the gas industry is afforded by the Stockholm Gas Company. Figures are available from that source of the labour employed in carbonizing; and comparison of these with similar figures on modern vertical and horizontal retort installations shows clearly the great labour-saving effected by bulk carbonization.

*Labour Employed in Carbonizing Only.*

| | Therms per Man per Day. |
|---|---|
| Vertical retorts (steamed) | 516 |
| Vertical retorts (not steamed) | 454 |
| Horizontal retorts | 541 |
| Stockholm horizontal-chamber ovens | 1216 |

The main product of straight carbonization, however carried out, is coke; and this represents usually at least 70 p.ct. of the weight of the coal treated. Coke is a solid smokeless fuel, but the importance of studying its suitability for various purposes, and the means for controlling its characteristic properties, has only in recent years been fully realized. The future trend of carbonizing plant construction and the possible great expansion of the industry are intimately connected with the smokeless fuel problem.

SOLID SMOKELESS FUEL.

Experiments indicate that the physical structure of the coke is especially important, and that for ease of combustion the area of the cell surfaces upon which gases can act should be as large as possible. Fine grinding of the coal, and suitable blending of strongly coking and non-coking or slightly coking coals or coke dust, have been shown to lead to such a fine-grained pore structure as to satisfy the above condition. C. H. Lander states that "cokes of high porosity and thin non-graphitic cell wall structure, if reasonably free from moisture and ash, and properly screened, should find a rapidly widening outlet for household purposes."

Much work remains to be done upon the question of coke structure as related to carbonizing conditions. It is fairly certain that even if the right type of structure is formed after the cessation of the partial fusion stage, the effects can be nullified in two possible ways: (1) By the deposition of graphitic carbon from gaseous hydrocarbons such as methane; (2) by prolonged overheating of the coke at temperatures above 800° C.

HIGH-TEMPERATURE COKE AS A DOMESTIC FUEL.

It is necessary, for high-temperature coke to be most successful as a smokeless fuel, that its combustibility shall be as high as possible; and work done up to the present shows that a fine-grained pore structure to be attained by suitable blending and fine grinding will tend to secure this. Subsequent factors, such as prolonged heating at high temperatures, which tend to nullify the advantages of such a structure, are to be avoided. Methods of carbonization which satisfy the last condition are: (1) Horizontal retorts. (2) Vertical continuous retorts. (3) Narrow chamber ovens of silica construction working at high flue temperatures.

Gas coke has in the past alone satisfied the combustibility condition, but the modern trend towards high-speed coking ovens has brought bye-product coke into the forefront. Made usually from washed coal, such coke is considerably lower in ash than gas coke, steaming with its effect in increasing ash content is not resorted to, while in the latest practice carbonization is not pushed until the last ounce of volatile matter is expelled.

A very important point to consider is that in the near future great strides will be taken in the chemical exploitation of the gas from high-temperature carbonization; and such advances will profoundly affect the economics of carbonization, and in all probability the price at which coke will be made available for sale.

On the new potential 40,000,000 tons per annum domestic coke market, gas coke has first claim. Gas-works are, indeed, admirably situated to take advantage of this market, placed as they are in the midst of the great consumers—the town dwellers. But the annual make of coke from gas-works is about 12 million tons, and a large proportion of this already goes to domestic coke boilers, closed stoves, central heating appliances, &c. The output of coke is strictly limited by the demand for gas, which, though it is steadily increasing, is only doing so at a rate somewhat greater than the growth of population. It is thus obvious that the gas industry alone is not likely, while proceeding along present lines, to make great inroads into the new market. It is also doubtful whether great changes will take place in the policy of the gas industry. It has been shown that the present tendency in the industry is towards lowering the coke yield and raising the gas therm yield by various devices, including that of driving off the last possible trace of volatile matter by intensive heating—a policy which is incidentally tending to reduce the combustibility of the coke considerably below that obtainable some years ago. The fact also of the companies being hemmed in considerably by statutory obligations as to capital, dividends, and price of gas will also act as a deterrent to radical changes of policy in this country. Thus it would seem necessary to look to the bye-product coking industry for the great expansion necessary to cope with the new demand.

### Sulphate of Ammonia Manufacture.

Until recent years ammonia recovery was one of the mainstays of carbonization, in that it contributed largely to the profits of the concern. Owing, however, to the recent competition of the cheaply-produced synthetic product, prices have fallen permanently to such an extent as greatly to reduce the importance of the ammonia plant as a profit-producing element of the works. In 1913 the price of sulphate was £13 per ton; to-day, with the general level of values supposed to be about 70 p.ct. above pre-war values, sulphate only commands a price of £10 to £11 per ton. In this country the synthetic ammonia works at Billingham has developed a large output within a short time; and it is anticipated that in the near future the output of the synthetic product will equal that of all the gas-works and bye-product coking plants combined. It is known that the demand for sulphate of ammonia for agricultural purposes is capable of an enormous extension, which is dependent, however, upon the lowering of prices. That prices will eventually drop still lower is fairly certain; and hence considerable attention is being given to methods of cheapening the recovery of ammonia at carbonizing plants. The first obvious step is to cut out indirect recovery, with its large consumption of steam. To make one ton of sulphate of ammonia, nearly one ton of 140° Tw. (*d* 1·70) commercial sulphuric acid is required, costing to-day about £3 per ton. Elimination of this cost would thus result in considerable saving. It is well known that the amount of sulphur, as hydrogen sulphide, in the foul gas from the ovens is usually more than sufficient to supply the requirements of the ammonia, if means can be found to convert it cheaply into sulphate radical.

### Benzole Recovery.

There is great room for improvement in the efficiency of benzole recovery from the gas. A figure of 85 p.ct. has been stated as that obtaining in good practice with the existing oil washing process, but the author would put it lower. With the coals carbonized in the Newcastle district the theoretical recovery would approach 3·5 gallons per ton of coal. In practice a figure nearer 2·5 gallons is obtained. In only one plant, to the author's knowledge, is 3 gallons exceeded, and there the figure is exceeded only because the plant is situated near a river from which unlimited supplies of cooling water can be taken. Creosote from coal tar is chiefly used as a scrubbing medium, and there appears to be a variation, in different parts of the country, in the suitability of the creosote of the district for the purpose. In this district coke-oven creosote seems to be obtained which has a great solvent capacity for naphthalene, and retains a large amount of this substance even after the usual settling and crystallization process at the tar distillery. As much as 35 p.ct. of naphthalene has been found in a creosote prepared for benzole washing. The naphthalene tends to find its way into the crude benzole, and the oil thus thickens rapidly. With coal-tar creosote, an absorption of about 3 to 4 p.ct. of benzole is all that can be obtained in the wash oil. Blast-furnace creosote (obtainable only in the North) gives slightly better results, is free from naphthalene, and its lower viscosity renders it suitable for mechanical scrubbers. A good oil scrubbing medium recently introduced is gas oil—a petroleum product. Concentrations up to 5 p.ct. are obtainable with this oil. It has the advantage of low viscosity, and the definite advantage that cooling of the gas to a low-temperature is not so necessary as with other washing media. It has the disadvantage of allowing paraffins to find their way into the crude benzole, and also of picking up sulphur from the gas, and forming a troublesome sludge containing sulphur compounds. In spite of the disadvantages, however, it seems to have distinct possibilities where good washing creosote is not obtainable. It has been proved that the sludge difficulty can be overcome, and the oil should be quite suitable where motor benzole is to be prepared.

New processes which give practically 100 p.ct. benzole recovery are solid absorption and the Claude process.

### The Working-Up of Tar.

The complete distillation of tar in the usual manner is not likely to extend to any great extent. There is a limited world demand for dye intermediates and the like produced from the distillates, and for briquetting binders in the form of the residue-pitch. If, as is anticipated, high-temperature carbonization increases very greatly in extent, there will be large quantities of tar which it will not pay to distil unless some yet unknown outlet for the distillates develops. However, it is fortunate that there has recently grown up a new and wide demand for tar prepared in a special manner for road making and road surfacing. The reconstruction of the roads of the country, and their upkeep, will cause a large and steady demand to be maintained. A competitor exists in imported asphalt and bitumen, but it has been proved that a superior road surface can be made with tar if it is prepared carefully to stringent specifications.

### Gas Exploitation Possibilities.

The total gas made by the gas industry during 1924 was 275,000 million c.ft. Practically all of this was distributed for heating and lighting purposes. Figures for the bye-product coking industry are not available; but, calculating from the total oven capacity, and allowing only 50 p.ct. surplus gas, then the potential surplus oven gas would be 105,000 million c.ft. per annum. It must be pointed out that with the present extended use of waste-heat ovens a large proportion of this gas would be merely represented by waste heat used under boilers. If all the plants were regenerative and capable of being heated by producer or blast-furnace gas, the annual yield of gas of a calorific value of about 500 B.Th.U. per c.ft. would be over 200,000 million c.ft. A large proportion of the plants in the country are regenerative in type and produce surplus gas amounting up to 65 p.ct. of their output. The disposal of this valuable bye-product has presented many difficulties in the past. In the future, however, it is to this source that the bye-product coking industry must look for a substantial means of revenue, and for opportunities for great chemical expansion within the industry. In the past it has been the practice in many places to burn the surplus gas to waste at an open flare, and yet—*mirabile dictu*—such plants have made profits. Several outlets have recently presented themselves for surplus gas which are likely in the near future to prove very remunerative—so much so, that it is probable that the tendency will be to instal combination ovens which can be fired with producer or blast-furnace gas, so that 100 p.ct. coal gas surplus may be obtained.

### Coke Oven Gas for Town Supply.

A somewhat slowly developing outlet is town gas supply. In a number of plants in this country, suitably situated, the surplus oven gas is piped to the nearest large town gas-works, purified there, and distributed. In some cases—*e.g.*, Middlesbrough—coke-oven gas has replaced the whole of the retort-house supply. In the United States the practice goes back to 1899, and now nearly half the gas distributed there is made at coke-oven plants, while of the remainder two-thirds is carburetted water gas. Gas managers in this country have been chary about taking coke oven gas for town supply; and the reason is not far to seek. One of the great essentials for successful town distribution is a steady supply, year in and year out; and of recent years the bye-product coking industry has shown few signs of being able to satisfy this condition. It has been a fluctuating industry; plants have had to shut down repeatedly on account of market conditions, labour disputes, &c. The industry has been far too dependent on the iron and steel industry, which is by nature a fluctuating one. The forecasted development of a large smokeless fuel market will do much to stabilize the industry, and will furnish an alternative demand when that for metallurgical coke falls off.

C. P. Finn discusses the whole question of the disposal of coke oven gas for public supply, and suggests that to convey gas from the coalfields to large cities by means of pipes laid beside the railways is not incapable of practical achievement. Long-distance pipelines from the pithead would reduce transit and marketing costs of raw coal, and bulk carbonization in the coalfields should secure economy of production. Natural gas is pumped along high-pressure pipelines distances of nearly 200 miles. Finn states that the distance to be covered, though no deterrent, may be a factor in deciding the location of the necessary sulphur purification plant. According to M. C. Berthelot, purification should be done at the coking plant, as in Belgium and Germany. Crude gas tends to block the pipes with iron oxide and sulphur. He deprecates the use of iron oxide purification at the ovens, owing to the expense, and recommends the American method of washing with sodium carbonate solution. On the other hand A. Thau points out the incompleteness of the wet method of purification, and recommends the improved dry Raffloer method in which specially prepared iron oxide in granular form is used. A continuous

shower of the material is maintained in the gas stream, and practically no trace of hydrogen sulphide leaves the plant. The cost of purification is said to be only one-ninth that of the ordinary static process in general use at gas-works, while the oxide can be worked up to 70 p.ct. of sulphur when fouled. The particulars are sufficiently startling to make the process well worthy of investigation.

SYNTHETIC AMMONIA PRODUCTION AT CARBONIZING PLANTS.

An exceptionally promising outlet for surplus gas is afforded by synthetic ammonia manufacture. The hydrogen in the gas is usually between 50 and 60 p.ct.; and various means are available for separating it from the other constituents. The hydrogen so separated can be used for the synthesis of ammonia, for hydrogenation of oils, or the berginization of coal and other products, while the residual high-calorific gas containing a large amount of methane can either be cracked to give a further large bulk of hydrogen, or used for heating the ovens, or for generating steam or electricity.

THE BERGIUS PROCESS.

The importance of the berginization of coal cannot be overestimated. For various reasons it is likely in the future to become a widely adopted process in the coal industry of the country; and the natural result will be that it will form an integral part of the bye-product coking plant with its supply of hydrogen ready to hand.

**Discussion.**

Dr. W. B. DAVIDSON observed that the paper was rather hard on the gas industry. At Birmingham a large Koppers plant was installed, but it proved expensive. Increasing the size of an undertaking did not always result in a decrease in cost of production. The reader of the paper had referred to continental practices. He (the speaker) had been much struck when on a visit to Berlin, fifteen years ago, to find the price of gas was double that at Birmingham. It seemed as if they had over-specialized in Germany. Regarding coke oven practice, the most important advance, to his mind, was the use of silica. Why, he asked, should they have a coke oven coke for domestic purposes which could never be as good as the continuous vertical coke?

Dr. WEYMAN, speaking of the recovery of benzole, considered that 3 galls. per ton of coal was a good yield. He favoured the indirect rather than the direct method of recovery of sulphate of ammonia.

Dr. J. T. DUNN urged that, if coke was to come into general use as a domestic fuel, it would have to be made from coal with less ash than they were using for coke making at present. His experience was that, with coke nuts, excellent fires could be produced in any household grate; and to his mind low-temperature coke was better than high-temperature coke. He looked forward to the time when it would be possible to market the former at a reasonable price.

Dr. E. W. SMITH favoured high-temperature carbonization. He mentioned that there were millions of gas fires in use, and their popularity was increasing. Solid smokeless fuel was only the halfway house. Only while houses had grates for solid fuel would it be used. The tendency to employ central heating was so extending that, given facilities, in fifty years no solid smokeless fuel would be needed. Heat would come through pipe or cable. One would like to see more collaboration between the coke ovens and the gas-works, for there was a possibility of great expansion in the use of coke oven gas for general purposes.

Mr. HOVEY contended that one serious fault in connection with coke ovens was the loss of sensible heat of the coke in the cooling-off process.

## Gas Meters and Foreign Coal.

One of the unforeseen and unfortunate results of the use of certain classes of foreign coal, owing to the stoppage of the home mining industry, is its effect on distribution. Complaints have been made by gas undertakings in different parts of the country regarding the unusual presence of naphthalene in services, which they definitely attribute to the use of low-grade coal from abroad. It is to be feared that the worst of the trouble has not been experienced. One of the features of the use of foreign coal is its effect upon meters. Already, we are informed, a large number of meters have had to be brought in through stoppage owing to naphthalene deposits. These deposits are particularly destructive to the leather diaphragms of dry meters, and also tend to dry up the lubricant in the stuffing-boxes. It is anticipated that the trouble which is developing in this direction will make itself felt long after the original cause has been removed, and the use of foreign coal almost forgotten.

**South Metropolitan Price Reduction.**—The Directors of the South Metropolitan Gas Company announce a reduction of ½d. per therm in the price of their gas, to take effect from the reading of the meters for the Christmas quarter. The present price of gas is 10½d. per therm.

**Reduction in Price at Cheltenham.**—The Directors of the Cheltenham Gas Light and Coke Company have decided to reduce the charge for gas by 2½d. per therm as from the December meter readings, thus reverting to the price obtaining prior to the coal stoppage—viz., 9½d. per therm. The increase rendered necessary by the strike has been confined to the December quarter only.

# CORRESPONDENCE.

*[We are not responsible for opinions expressed by Correspondents.]*

## Where are the Students?

SIR,—The "Where are the Students?" discussion which has been proceeding in your correspondence columns came under review at the meeting of the Advisory Committee on the 14th inst.

It was unanimously decided to call a conference of representatives of the Junior Gas Associations of England, Scotland, and Wales on March 9, to consider the various points raised in the correspondence, and other matters connected with the working of the Education Scheme, particularly as they affect the free inflow of students. Further particulars will be announced in due course. It may be explained that the date has been fixed far enough ahead to allow of the results of inquiries which are now proceeding being received and considered prior to the meeting.

WALTER HOLE,
Organizing Secretary, Institution Education Scheme.

*Wharfedale,*
*Barton, Torquay,*
*Dec. 15, 1926.*

## Institution of Gas Engineers' Education Scheme—Conditions Governing the Award of Certificates.

SIR,—The number of inquiries received, together with the disappointing results in the cases of a few candidates at the examinations held last May—results which ought to have been avoided—indicate that, notwithstanding all that has been written and spoken on the subject, the method of award of the Institution's certificates is not yet appreciated as it should be. The certificates are "Grouped Course Certificates;" and, in their award, home work, laboratory work, class work, drawing, and class attendances are all taken into account.

In order to prevent similar disappointments next year, and as a guide to all candidates, may I once again draw attention to Regulations 13 and 14, pp. 10 and 11 of "The Green Book," which set out these conditions, and read as follows:

SECOND-CLASS CERTIFICATE.

13. In order to obtain a second-class certificate, a candidate must make not less than 60 p.ct. of the possible attendances in each year of the course and must obtain in the final year:

(i.) Not less than 50 p.ct. of the possible marks in the examination in Gas Engineering or Gas Supply;
(ii.) not less than 40 p.ct. of the possible marks in the examination in each of the ancillary subjects;
(iii.) not less than 40 p.ct. of the possible marks obtainable for home work, class work, laboratory work, &c., taken separately in each subject for which such marks are awarded under the approved scheme;
(iv.) not less than 50 p.ct. of the grand total of marks obtainable in the final year. Of this total, the possible marks in the Final Examination should constitute not less than seven-tenths.

FIRST-CLASS CERTIFICATE.

14. A certificate of the first class will be awarded to a candidate who, having satisfied all the conditions, has obtained:

(i.) Not less than 70 p.ct. of the possible marks in the examination in Gas Engineering or Gas Supply;
(ii.) not less than 60 p.ct. of the possible marks in the examination in each of the ancillary subjects;
(iii.) not less than 40 p.ct. of the possible marks obtainable for home work, class work, laboratory work, &c., taken separately in each subject for which such marks are awarded under the approved scheme;
(iv.) not less than 70 p.ct of the grand total of marks obtainable in the final year. Of this total, the possible marks in the Final Examination should constitute not less than seven-tenths.

An addition made since the book was compiled further provides that a candidate who obtains 85 p.ct. of the possible marks in either Gas Engineering or Gas Supply, as well as fulfilling all the conditions for a first class, will be awarded "Distinction," and the certificate will be so endorsed.

WALTER HOLE,
Organizing Secretary, Institution Education Scheme.

*Wharfedale,*
*Barton, Torquay,*
*Dec. 17, 1926.*

# PARLIAMENTARY INTELLIGENCE.

## HOUSE OF LORDS.

Before Parliament was prorogued on Wednesday, Dec. 15, the following Bills received the Royal Assent: Barnet District Gas and Water, Electricity Supply, and Public Health (Smoke Abatement).

**Special Orders.**

The following Special Orders were last week approved in both Houses: Bridgwater, Hoddesdon, Leighton Buzzard, Ludlow, Redditch, Torquay, and Warrington Gas Orders.

# MISCELLANEOUS NEWS.

## GAS REGULATION ACT APPLICATIONS.

### AMENDING ORDERS.

**Elstree and Boreham Wood Gas Company, Ltd.**

To substitute for the existing standard price of 16d. per therm a standard price of 17d., until Dec. 31, 1927.

**Ipswich Gas Light Company.**

To substitute for the existing standard price of 15·2d. per therm a standard price of 17·2d., until June 30, 1927.

**Knottingley Gas Company.**

To substitute for the existing standard price of 14d. per therm a standard price of 20d., until Dec. 31, 1928.

### DECLARATION OF CALORIFIC VALUE.

**Ludlow Union Gas Company, Ltd.**—500 B.Th.U. (Dec. 27.)

## INCREASES IN THE PRICE OF GAS.

The Beverley Town Council have resolved to increase the price of gas by 10d. per 1000 c.ft.

When the Hamilton Town Council, last week, took stock of their financial affairs in connection with municipal undertakings, it was reported that the expenditure in excess of the estimate at the burgh gas-works was £22,000. It was decided to increase the price of gas by 5d. per 1000 c.ft., to 3s. 4d., from the December survey.

The price at Leigh has been raised from 3s. 3d. to 3s. 9d. per 1000 c.ft.

The Stratford-on-Avon Town Council have decided to increase the price to ordinary consumers by 6d. per 1000 c.ft., from the end of the present quarter.

The Vale of Leven Gas Company, Ltd., have found it necessary to increase their prices as follows: Ordinary consumers, 4s. 7d. per 1000 c.ft.; and gas engines, 4s. 5d. Prepayment consumers will receive 16 c.ft. for 1d.

## IMPERIAL CHEMICAL INDUSTRIES, LTD.

Mention has been made in the "JOURNAL" of the registration of Imperial Chemical Industries, Ltd., with an authorized capital of £65,000,000. If all the shareholders of the merging Companies exchange their shares for shares in the new Company, the issued capital will be £56,802,996.

The following paragraphs are extracted from the circulars issued to the shareholders of these merging Companies; the circulars themselves being signed by the Right Hon. Sir Alfred Mond, Bart., M.P., as Chairman of Brunner, Mond, & Co., Ltd.; Sir Harry McGowan, K.B.E., as Chairman of Nobel Industries, Ltd.; Sir Max Muspratt, Bart., as Chairman of the United Alkali Company, Ltd.; and the Right Hon. the Lord Ashfield, P.C., as Chairman of the British Dyestuffs Corporation, Ltd.

UNANIMOUS RECOMMENDATION TO EXCHANGE SHARES.

The Boards of your respective Companies are unanimous in recommending you to make this exchange of shares. . . . We have no hesitation in asking our shareholders to follow the examples of ourselves and our Boards and to exchange their shares in the Companies in which they are now interested for the shares in Imperial Chemical Industries, Ltd. We feel confident that such an exchange will be beneficial to them, that they will secure, from the wide scope of the new Company's operations, an effective insurance against the results of fluctuations of prices or trade to which every individual company is subject, and that they will thereby be enabled to participate in the growing trade of the chemical industry and in the potential profits of its future developments.

THE IMPERIAL ASPECT.

The Company has, of deliberate purpose, been given the title of Imperial Chemical Industries, Ltd. The British Empire is the greatest single economic unit in the world—one in which every patriotic member of the great British Commonwealth has a personal interest. By linking the title of the new Company to that unit, it is intended to lay emphasis upon the fact that the promotion of Imperial trading interests will command the special consideration and thought of those who will be responsible for directing this new Company. The participating Companies already enjoy a world-wide trade. Their merchanting and manufacturing operations therefore extend throughout the British Dominions overseas; and it will be the avowed intention of the new Company, without limiting their activities in foreign overseas markets, specially to extend the development and importance of the chemical industry throughout the Empire.

DIVIDENDS.

The profits of the Company to be distributed are to be applied in the following order:

(1) In paying a cumulative dividend at the rate of 7 p.ct. per annum upon the preference shares.
(2) In paying a non-cumulative dividend at the rate of 7 p.ct. per annum upon the ordinary shares.
(3) In distributing the balance between the holders of the ordinary and deferred shares in the ratio of two-thirds to the ordinary shares and one-third to the deferred shares.

Shareholders in the participating Companies will retain their existing dividend rights up to Dec. 31, 1926. The shares in the new Company will rank for dividend as from Jan. 1, 1927. The preference dividend will be payable half-yearly on Aug. 1 and Feb. 1, covering the periods to June 30 and Dec. 31 respectively.

PROSPECTS.

On the basis of the earnings of the four participating Companies and their subsidiaries for their last completed financial years, the Chairmen of the four participating Companies are satisfied that, after making due provision for reserves, the future earnings of the new Company, if all the shares are exchanged, should exceed £4,000,000—a sum sufficient to cover payment of the preference dividend more than three-and-a-half times, and to leave available for dividend on the remaining capital a sum approximately £2,865,000. This estimate takes no account of the benefits expected to flow from the union of interests of the four participating Companies.

## LANCASTER AND THE COAL STRIKE.

Mr. G. Dixon, the Lancaster Gas Engineer, has reported to his Committee as to the effects of the coal dispute on the undertaking. The stock of coal at the works on May 1 was 2500 tons; and there was 500 tons in wagons. During the strike there were used 12,000 tons of coal, 1060 tons of coke, and 51,000 gallons of oil. The cost of fuel above the normal was £20,370; but the increased revenue from residuals of £4375 made the net loss due to the strike about £16,000. This does not include the increased cost of raw materials now being paid, interest on the bank overdraft, excessive wear and tear of plant due to abnormal working, loss due to delay in completing new extension, loss of gas revenue from restrictions on public lighting, loss on coke sold at a cheap rate to poor people, demurrage charges or siding rents demanded by the Railway Company due to fuel being bought in cargoes, or increased charges owing to consumers' complaints of stoppages.

The price of gas has been increased from the September readings by 7d. per 1000 c.ft., which will bring in £5500 up to March 31, 1927, and reduce the net cost of the dispute to £10,500, which debit will have to be carried forward. A full year should clear off the deficit, provided coal and residual markets remain at pre-strike level. The maintenance of the supply has only been achieved at great sacrifice and inconvenience to the office and works staff. The office staff worked at high pressure, with much overtime, without recompense. The works staff had been paid overtime; but considerable danger attended their work, because of the abominable quality of the fuel often received from abroad, and from the over-working of the water-gas plant. The explosion of the water-gas plant in May, and the number of burns treated by the ambulance section, were evidence of the danger to which the men had been subjected. Not once had any man complained; and he was unable to express adequately his appreciation of the wholehearted service which all employees had rendered. He wished to record his appreciation of the patience and assistance of the consumers in the difficult period.

The damage to the water-gas plant by the explosion had been agreed at £159 10s. 8d.

The Committee have placed on record their appreciation of the services of the staff during the dispute.

## BOOSTING GAS IN MANXLAND.

### A Successful Douglas Exhibition.

There was recently concluded at this popular holiday resort an exhibition (the first since pre-war days) which has demonstrated to the residents and visitors the great advantages in efficiency and economy of modern gas lighting, heating, and cooking appliances. It was under the auspices of the Douglas Gas Light Company, and there was an extensive range of the cooking and heating appliances of Messrs. R. & A. Main, Ltd., gas lighting appliances by the Welsbach Company, and the Jackson self-feeding water boilers and heaters. The opening ceremony was performed by Miss Hill, daughter of the Governor of the Island—Sir Claude Hill. Representing the Douglas Gas Company were Messrs. C. H. Kay (Chairman), P. J. Crellin, W. H. Halton, R. E. E. Quilliam, R. C. Cain, A. R. Bisset (Manager), and W. H. Crellin (Secretary). So great was the attendance on the opening day that the hall was crowded-out, and the doors had to be closed.

Each afternoon and evening excellent work was accomplished by Miss H. H. Tuxford, M.C.A., the well-known cookery lecturer, who used for her demonstrations a Main cooker with the patent "Conservor" oven. Much interest was displayed by the audiences in the excellent results achieved by the use of this oven—particularly in regard to its economy in gas consumption, and the evenness of the top and bottom heat due to its two burners, which enabled the entire oven space to be used during the cooking operations.

**New Showrooms at Oswaldtwistle.**—New gas showrooms in Union Road, Oswaldtwistle, have been erected by the Oswaldtwistle Council. The opening ceremony was performed, on Dec. 16, by Councillor Scholes, Chairman of the Gas Committee, who said that, during last year, the Department had sold appliances worth £3100. Increased business was expected. Mr. A. J. Harrison, the Manager to the Accrington Gas Board, reviewing the position of the industry, predicted a great future for it. He could not believe, he said, that an industry which could extract 80 p.ct. of the potential heat energy in coal was going to be ousted by any competitor. The value of gas had been demonstrated during the last half-year. In his own area, 22,000 families would have been affected if the gas supply had failed—to say nothing of those who would have been thrown out of employment.

## STATISTICS OF RATES AND CHARGES.

### The Position Compared with a Year Ago.

The annual compilation by Mr. W. Allison Davies, Borough Treasurer of Preston, of statistics relating to the rates levied in various towns, together with the charges for gas, water, and electricity, and profits and losses on municipal undertakings, is a heavy task which he performs with extreme regularity, and as great a degree of accuracy. For the furnishing of the figures he is, of course, indebted to the officials of the localities dealt with in the return, to whom he tenders his appreciative thanks. The tables now to hand relate to the financial period 1926-27; and particulars are given with regard to 83 county boroughs, 95 boroughs, 55 urban districts, and 28 Metropolitan boroughs. From year to year further names are included; and on the present occasion there have been added eight boroughs and nine urban districts. The particulars with regard to gas supplies embrace the charge per 1000 c.ft., as well as per therm, where the Gas Regulation Act has been adopted, and the declared calorific value.

#### RATING STATISTICS.

In the matter of the rating statistics, there are set forth the census of 1921 and the estimated population at Midsummer, 1925. Then follow the area, the rateable value—total for 1925-26 and 1926-27 and per head of the 1925 estimated population—the amounts produced by a penny rate, the rates per head, the total rates in the pound required, the relief from undertakings, and the total rates levied for 1925-26 and 1926-27. The average rates levied for the financial period 1926-27 in the case of the first three groups into which the return is divided are as follows: County Boroughs, 14s. 1½d. in the pound, as compared with 13s. 6½d. a year ago; boroughs, 13s. 7⅝d., as against 13s. 1⅜d.; and urban districts, 14s. 3½d., as against 13s. 9½d.

The Metropolitan boroughs again show about an equal number of rises and falls; but some of the increases are heavy. Thus, in the twelve months the rates in Bethnal Green have gone up from 15s. 8d. to 22s.; in Poplar, from 23s. to 25s.; and in Stepney, from 14s. 9d. to 19s. (approximate average). Westminster is still the lowest rated of the Metropolitan boroughs, at 9s. 6d. in the pound, though St. Marylebone runs it close, with a figure of 9s. 9d. In Bermondsey there has been a rise from 17s. 4d. to 18s. 7d., and Southwark from 12s. 0¾d. to 15s. 6½d. (approximate average). The largest falls are 10d. in the cases of Hampstead (from 11s. 8d. to 10s. 10d.) and Kensington (from 10s. 11d. to 10s. 1d.).

Turning to the 83 county boroughs, though the average rates levied are on the present occasion only about 7d. more in the pound—at 14s. 1⅜d.—than a year ago, individual places show many bigger variations than this. The rates are over 20s. in the pound at: East Ham, 23s. 5d., the same as a year ago; Gateshead, 23s. 9d., as against 17s. 9d.; Merthyr Tydfil, 27s. 2d., as against 26s.; and West Ham, 24s. 4d., as against 23s. 11d. Rated at 9s. in the pound or under are: Blackpool, 7s. 6d.; Bournemouth, 8s. 2d.; Darlington, 9s.; Oxford, 7s. 8d.; and Southport, 8s. 4d.

As to the boroughs, in which the average figure is 6d. higher, at 13s. 7⅞d., the rates are 18s. or more in the pound in the following instances: Chesterfield, 21s. 4d., or 3s. more than a year ago; Colchester, 18s. 11d.; Hartlepool, 18s. 8d., which is 4s. more; Ilkeston, 18s., or an increase of 2s.; Jarrow, 19s. 11d., a rise of 2s. 10d.; Keighley, 19s. 6d., an addition of 2s. 6d.; Llanelly, 21s., or 2s. 5d. more; Nuneaton 19s. 6d., which is 2s. more; and Stockton-on-Tees, 18s. 10d., or a rise of 2s. 8d. With rates under 9s. is Bexhill, with 7s. 7d.

Lastly there are the 55 urban districts, with an average rating of 14s. 3⅛d. in the pound, or some 6d. more than a year ago. In this list the highest-rated places are: Aberdare, at 24s. 2d., as compared with 22s. 6d.; Leyton, at 22s. 4d., or a reduction of 2d.; Tottenham, at 19s., also a reduction of 2d.; Walthamstow, 25s. 3d., an addition of 11d.; Woodford, 19s. 4d., which is 1s. more; and Worksop, 20s. 9d., an increase of no less than 4s. 4d., as compared with 1925-26. At the other end of the scale are: Epsom, 9s. 11d.; Fleetwood, 9s. 8d.; Hendon, 8s. 4d.; Sutton (Surrey), 8s. 6d., which is a reduction of 1s. 2d., when compared with a year ago.

#### MUNICIPAL UNDERTAKINGS—PROFIT AND LOSS.

It is seen from another section of the return that the rates levied in the following towns have in the period under review been reduced to the extent of 1s. or more in the pound by transfers from municipal undertakings, &c.; but the figures already quoted are those of rates actually levied, after allowing for any such transfers: Nottingham, 1s. 1⅜d.; Walsall, 1s. 6⅞d.; Great Yarmouth, 1s. 4d.; Doncaster, 1s. 5⅜d.; Loughborough, 1s. 1⅜d.; and Stafford, 1s. 3½d. On the other hand, there appear the names of the following places in which deficiencies on municipal trading undertakings have been incurred to an extent necessitating rates in aid amounting in the aggregate to 1s. in the pound or over: East Ham, 1s. 3½d.; Merthyr Tydfil, 2s.; Middlesbrough, 1s. 2½d.; Preston, 1s. 3⅜d.; Bacup, 2s. 3d.; Batley, 1s. 0½d.; Buxton, 1s. 2⅜d.; Colne, 1s. 1d.; Harrogate, 1s. 2½d.; Keighley, 4s. 0½d.; Llanelly, 1s. 11⅜d.; Stockton-on-Tees, 2s. 1⅜d.; Abercorn, 2s. 3d.; Aberdare, 2s. 1⅜d.; Colwyn Bay, 1s. 2⅜d.; and Walthamstow, 1s. 9½d.

The present return includes four places in which the profits transferred from gas undertakings in relief of rates reached £10,000; this comparing with the same number of instances a year ago, and eleven in 1924-25. The places on this occasion are: Belfast, £11,460; Birmingham, £41,200; Nottingham, £25,787, Salford, £10,000. On the present occasion there are five cases of transfers from the rates to municipal gas undertakings in respect of deficiencies. These are: Dewsbury, £3300; Bacup, £4500; Morley, £1000; Scunthorpe and Frodingham, £712; and Swadlincote, £1040.

## TRADE NOTES.

**The Keith-Blackman Dust Separator Fan.**

Messrs. James Keith & Blackman Company, Ltd., of 27, Farringdon Avenue, E.C.4, have brought out a booklet describing and illustrating their patent dust separator fan.

**Gas Boilers for Greenhouses, Garages, &c.**

Messrs. Fenlon & Son, of 8, Tudor Street, Ludgate Circus, E.C.4, have published an information booklet (containing an interesting article on banana ripening, and extracts from "Gardening Illustrated" and "Amateur Gardening") describing their "Dwarf-Lorne" and "Twin Dwarf-Lorne" cast-iron gas boilers.

**"T.I.C." Plant for Annan.**

On the recommendation of their Manager, Mr. H. Robinson, the Annan Gas Company have placed an order with the Woodall-Duckham Vertical Retort & Oven Construction Company (1920), Ltd., for a "T.I.C." tar treatment plant capable of producing tars to the Road Board specification, with a capacity of 10 tons per 24 hours.

## CONTRACTS OPEN.

**Resetting Retorts.**

Tenders are invited by the Clacton Urban District Council Gas Department for the resetting of retorts. [See advert. on p. 783.]

**Coal.**

Tenders are invited by the Sidmouth Urban District Council for the supply of Yorkshire screened gas coal. [See advert. on p. 783.]

## EXTENSIONS.

**Washer for Lancaster.**

The Gas Committee of the Lancaster Corporation have asked the Engineer to prepare specifications for a new ammonia washer, with a capacity of 2,000,000 c.ft. a day.

An explosion occurred recently at the South Minster Gas-Works, and Mr. James Beard, the Manager, was slightly injured. He was flung across the meter room. There was a slight outbreak of fire, which was quickly extinguished.

On Monday, Dec. 6, Mr. and Mrs. W. T. Betts, of Deal, had an alarming experience as they were seated at their mid-day meal; a violent explosion of gas completely wrecking their house. Fortunately they escaped without injury.

An explosion of gas occurred on the 17th inst. in the smoothing-room of the stitching and bleaching factory owned by Messrs. Robert M'Bride & Co., Ltd., Alfred Street, Belfast, as a result of which two women received treatment at hospital, while several others had narrow escapes. Some sixty girls were working in the room.

WATER GAS PLANT.

ECONOMICAL GAS APPARATUS CONSTRUCTION COMPANY, LIMITED.

36, Victoria Street, London, S.W.

## NORTH-EAST COAST COAL TRADE.

**From our Own Correspondent.**

Shortage of wagons has again caused difficulties, and in one or two instances collieries have been stopped from this cause. Boats have also been scarce, and are still apparently being turned round very slowly, especially in the Thames. The continued arrival of foreign coal cargoes is held responsible for many of these troubles. The ridiculous situation has occurred during the week of a boat discharging foreign coal in the Tyne, while a local colliery, badly in need of an outlet, was waiting to load her with an export cargo.

The market on the whole is very disappointing to producers, who were hoping for active conditions to enable them to some extent to make up the enormous losses incurred this year. In actual fact, they are experiencing a very poor demand. Northumberland steams seem fairly well booked; but the Durham market is undoubtedly short of trade, and prices show a downward tendency. Wear Specials and best gas makes maintain a nominal quotation of 23s. f.o.b.; but this price is not obtainable, and the situation is such that prompt cargoes could be picked up considerably cheaper from collieries requiring a prompt team. Second-class gas is quoted 18s. 6d. to 19s. 6d. f.o.b. Export demand remains slow, and forward sales for next year are making little progress at these figures. Durham unscreened coking is quoted 18s. 6d. to 19s. 6d., and best Durham bunkers ask 22s.

Gas coke is in poor demand, and export requirements are small; 35s. to 40s. f.o.b. being asked.

## YORKSHIRE AND LANCASHIRE COAL TRADE.

**From our Local Correspondent.**

The market for household coal is not yet stabilized, although the next few days will probably see an increased demand from householders. It is anticipated that the export market will open up early in the New Year.

Gas undertakings are receiving their contract supplies of fuel, and there is still a limited quantity of foreign coal to arrive. Prices generally are compatible with the situation at the respective supplying collieries, and it will probably be a few weeks before the trade is in a more settled state.

## COAL TRADE IN THE MIDLANDS.

**From Our Local Correspondent.**

Negotiations are proceeding with regard to fuel for the service of industry; but consumers are limiting their purchases as far as safety will allow. They hold that prices still rest on an artificial basis, and that they will have to come down considerably lower as market disorganization passes. While absorptive capacity has not increased proportionately to the increase of output, there is pressure for particular grades of coal which were unobtainable in the indiscriminate marketing arrangements necessitated by the recent shortage.

This means that price subsidence is irregular, and that there are incongruities such as do not arise in normal practice. Some deliveries which are being made against old outstanding contracts serve to emphasize the disparity between current quotations and those which prevailed before the stoppage. Slacks are mentioned at as low a price as 11s. to clear now, but the more general range is 14s. to 18s. Steams are round about 25s. at the pithead.

The coke situation is approaching the crucial stage. Suppliers conclude that in view of their pre-stoppage commitments in the matter of furnace coke they cannot afford to put new business on the books at less than 20s. Smelters demur strongly to this, and are pressing for better terms. The rate of resumption at the blast-furnaces will depend upon the issue, for there are uncompleted contracts for pig iron which have to be honoured when a fresh start is made.

Transport has been further interfered with by the diversion of wagons to the carriage of general merchandise for the Christmas trade. This affects both the industrial and the domestic user. The demand for household coal has been longer in attaining its seasonal momentum than had been anticipated. Best coal has been quoted 40s. upwards at pits.

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**Gas Supply of Beverley.**—The Beverley Town Council have decided to engage a consulting engineer to examine and report on the general condition of the gas-works, and as to the necessity or otherwise of additional plant. There has been much complaint of poor gas supply during and since the coal strike. A report by the Gas Engineer and Manager states that the trouble was caused through inability to get good coal, and lack of pressure consequent on old mains of insufficient capacity.

**Birmingham Corporation Man's Death.**—At the Birmingham County Court, on Tuesday, an application was made for compensation on behalf of Honorah King, widow, of Devon Street, Saltley, in respect of the death of her husband, a labourer, who was employed by the Birmingham Corporation at the Nechells Gas-Works. He had been a labourer there for fourteen years, and on Nov. 25 sustained an injury to his right hand, which was caught in the coupling of some trucks. His hand was lacerated, and septic poisoning occurred. Death was attributed to "toxæmin and erysipelas of the abdominal wall." The doctor had no knowledge that there had been an accident. Judge Dobb, in finding for the Corporation, inquired whether they had considered the giving of a sympathetic award, in view of the fact that it was a doubtful case.


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## CURRENT SALES OF GAS PRODUCTS.

### The London Market for Tar, Tar Products, and Sulphate.

LONDON, *Dec.* 20.

The market for tar products is quiet. There is little inquiry for pitch, but, on the other hand, there is very little material available. The value is rather nominal.

Creosote is scarce, and the price is firm at about 9¼d. net per gallon in bulk.

Pure benzole is about 2s. 6d. per gallon, pure toluole 2s. 9d. to 3s. per gallon, 90's toluole 2s. 6d. to 2s. 9d. per gallon, 95/160 solvent naphtha about 2s. per gallon.

### Tar Products in the Provinces.

*Dec.* 20.

The average values for gas-works products during the week were: Gas-works tar, 88s. to 93s. Pitch, East Coast, 127s. 6d. to 130s. f.o.b. West Coast—Manchester, 120s. to 122s. 6d.; Liverpool, 122s. 6d. to 125s.; Clyde, 125s. 127s. 6d. Benzole 90 p.ct., North, 1s. 11d. to 2s.; crude, 65 p.ct. at 120° C., 1s. 4d. to 1s. 5d. naked at makers' works; 50-90 p.ct., naked, North, 1s. 11d. to 2s. Toluole, naked, North, 1s. 11d. to 2s. nominal. Coal-tar crude naphtha, in bulk, 9d. to 9¼d. Solvent naphtha, naked, North, 1s. 9d. to 1s. 10d. Heavy naphtha, North, 1s. 1d. to 1s. 2d. Creosote, in bulk, North, liquid, 8¼d. to 9d.; salty, 8d. to 8¼d.; Scotland, 7⅞d. to 8⅛d. Heavy oils, in bulk, North, 7¼d. to 7⅜d. Carbolic acid, 60 p.ct., 1s. 9½d. to 1s. 10½d. prompt. Naphthalene, £11 to £14; salts, 90s. to 100s., bags included. Anthracene, "A" quality, 2½d. per minimum 40 p.ct., purely nominal; "B" quality, unsaleable.

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**Price of Coke at Bradford.**—The Bradford Corporation Gas Committee have decided (subject to the City Council's approval) to increase the price of coke by 10s., to the figure of 40s. per ton for domestic purposes. The price for industrial purposes remains at 50s. It may be remembered that some months ago the Gas Committee recommended that the price of all coke should be 50s.; but this was just before the municipal elections, and the City Council demanded a price of 10s. less for domestic uses. In view of the then apparent improvement in the coal situation, and the general hardship on the public, the Gas Committee, with this 10s. less forced upon them by the City Council, made the domestic price still another 10s. less; so that, while coke for industrial purposes was priced at 50s., that for domestic use was put at 30s. There has been a good deal of complaint about the matter on the part of industrial users—particularly the small ones, such as bakers and shopkeepers generally.

**Weymouth Gas Company's Dinner.**—The public-spirited way in which the Weymouth Consumers' Gas Company came to the relief of the general public during the coal shortage, by deciding not to increase the price of gas or coke, was commented upon with a good deal of pride and satisfaction at the Hotel Burdon on Saturday, Dec. 11, when the Directors gave their annual dinner to their staff and employees. The Mayor, Councillor P. A'Court, congratulated the Company and their Engineer and Manager, Mr. J. J. Joyce; and Mr. M. C. Frowde (Chairman of Directors) remarked that, when coal was practically unobtainable, the Company had supplied hotels, hospitals, &c., which would otherwise have been unable to carry on. During the year, the Company had installed more than 600 new cookers, gas fires, and so on, and had added more than 300 consumers to their books. In the period of the strike, they could have sold their coke at double the price, but they determined to serve the public to the best possible advantage, and had not raised the price at all.

**Demand for Gas at St. Mary Church.**—The Torquay Town Council were informed recently that a report had been made by the Gas Manager (Mr. F. Chalmers) to the effect that the demand for gas at St. Mary Church and Babbacombe was so great that the gas-works were being run at high pressure, and it was impossible as a consequence to carry out even minor repairs to the manufacturing plant. The Manager said the position was such that, should anything go wrong, or should there be a spell of cold weather, he could hardly see how the supply could be maintained; and in the circumstances he suggested that the matter be brought to the notice of the Torquay and Paignton Gas Company, with a view to their co-operation to prevent any breakdown in the supply. The Town Clerk stated that it was not probable that the Torquay Gas Order concerning the sale of the undertaking to the Torquay and Paignton Gas Company would be confirmed by Parliament before February or March next; and he was instructed to communicate with the Company and forward a copy of Mr. Chalmers' report.

**Mr. Cook's "Omelette."**—Reasons why the public may not expect an early reduction in the price of gas were given by Mr. F. W. Goodenough, Executive Chairman of the "B.C.G.A.," speaking on Dec. 15 as the guest of the Bishopsgate Ward Club at dinner at the Great Eastern Hotel, Bishopsgate, E.C. "The coal stoppage," said Mr. Goodenough, "has involved the Gas Light and Coke Company in an extra bill for coal of £2,400,000. Of that, £500,000 would be recovered in the higher price for coke, leaving £1,900,000 for the unfortunate gas consumer to pay for the eggs broken by Mr. Cook in making, not an omelette, but a sorry mess. As the price of gas remained stationary through the greater part of that critical period, and we (the Gas Light and Coke Company) have only just raised it to 25 p.ct. above pre-strike price, we cannot reduce it until that little bill of £2,000,000 has been squared. The increase in price means no increase in profit. If every domestic and industrial commodity were equally well safeguarded by legislation in regard to quality, quantity, price, and profit as is the supply of gas, the word profiteering would never have appeared in the English language."

## Development in Gas Controllers.

The Horstmann Gear Company, Ltd., of Newbridge Works, Bath, who report a successful season in spite of the difficulties occasioned by the trouble in the coal industry, are embodying some interesting variations in their controllers for 1927. Dealing first with their popular type of 3A/UNI controller, this is practically unaltered, with the exception that the dial is now optionally available marked 1 to 24, instead of the double 12-hour night and day dial hitherto universally used. The adoption of this 24-hour dial eliminates errors in setting the controller, once the attendant has been correctly instructed. Though not yet ready for the market, it is also intended in due course to supply all controllers with dials having black background and white filled figures, as it has been found that, by reversing the usual colour scheme of black figures on a white background, the controller is much easier to set on dull November days when there is only a poor light. All soldering operations on Newbridge controllers are now entirely eliminated; rivetting and screwing being adopted instead. In view of the substantial demand for Newbridge controllers in tropical and sub-tropical countries, the firm are fitting the Type 3A/UNI and other 3A models with arrangements for rendering the movement entirely insect-proof. Various models are now available with hand-operated cocks for use during fogs; two systems being standardized, namely: (*a*) The provision of a hand lever to turn the gas on for fog during the day-time; the controller making an idle move at the next lighting time, and extinguishing in the ordinary way the following morning. (*b*) The provision of a separate gas cock by-passing the automatic action, so that when the gas has been turned on by hand for fog, it remains on until it is turned-off by hand at the conclusion of the fog. In view of the tendency on the part of public lighting authorities to use suspension and upright harp lamps of medium power, the Company have introduced two new types of controllers, these being contained in cast-iron weather-proof cases, and embodying 15-day movements. They are small and compact. A record amount of business has been done by the Horstmann Gear Company, Ltd., in 1926, in checking or midnight-reduction controllers of various patterns; and models are now available for every conceivable type of public lamp, including square lanterns with large or small clusters, and suspension and harp lamps of large and small capacity. The Company have recently added a new bay to their works, which is now practically completed; and when this is ready, the output of Newbridge controllers will be much higher than in the past.

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**Metropolitan Gas Meters, Ltd.**—Metropolitan Gas Meters, Ltd., held their 27th annual general meeting at Winchester House on the 17th inst., when a dividend was declared at the rate of 5 p.ct. per annum, which was an increase of 2½ p.ct. over last year's dividend. The Chairman reported that this result was brought about by the termination of the price cutting in June, the continued progress in the sales of the "Duplex" clock controller, and the increasing demand for their new front change plate meter (the defects of which were so infinitesimal as to be practically negligible). The shareholders passed a resolution thanking the Directors and their staff for the satisfactory way in which they had conducted the business during the last twelve months.

**Tribute to the Smethwick Gas Engineer.**—At a recent meeting of the Smethwick Town Council, Alderman Pinkney, in submitting the report of the Gas Committee, said it was only right that he should express their indebtedness to the Gas Engineer, Mr. E. Hardiker, for the steps he had taken to keep the gas undertaking in operation during the eventful days that had gone. Not only the manufacturers, but the domestic side, had cause for gratitude. The speaker showed that in cases of sickness and in homes where there were invalids, they had been supplied by the undertaking with the necessary warmth. It had been no mean performance; and Mr. Hardiker—it was a good thing he was a young man—had worked hard in order to maintain the supply of gas. They were greatly indebted to him for the effort he had made and the success that had attended it.

**New German Process of Coal Distillation.**—In "The Times" for Dec. 15, it is mentioned that on Dec. 14 the Board of the German Dye Trust, I.G., Farbenindustrie A.G., held a meeting in Heldenberg, after which a communication was issued containing the following passage: We have discovered, patented, and developed a coal distillation process of our own, and we are convinced that, unlike the processes hitherto known, it will pay. Our process is an independent development on the basis of knowledge obtained by us. As, however, our process rests to some extent on the fundamental work of Dr. Bergius, we have also secured the Bergius patent for lignite in Germany exclusively, and have made possible the use of hard coal by acquiring a considerable interest in the Kobergin A.G. Abroad, the I.G. has acquired a considerable interest in the International Bergin Company of The Hague, which owns the Bergius patents outside Germany.

**Gas Price Problem in Salford.**—By a majority of four, the Salford City Council, at a special meeting on Dec. 15—when the Mayor (Alderman J. Rothwell) presided—rescinded the resolution passed a fortnight ago declining to adopt the Gas Committee's recommendation to increase the price of gas by 6d. per 1000 c.ft. to meet the extra cost of coal during the strike. The effect of this vote would be that the higher price would come into operation as from Dec. 31. What may actually happen is yet uncertain for the reason that, immediately following the meeting, Councillor G. Howard, a prominent member of the Labour group, in collaboration with another Labour member, three Independents, and one Conservative, signed a requisition, which was at once presented to the Mayor, asking him to call a further special meeting of the Council again to consider the question. The Mayor agreed to convene a meeting for to-day, unless in the meantime the petition should be withdrawn.

# STOCK MARKET REPORT.

ON the Stock Exchange last week the usual end-of-year complaints of no business were made by dealers; and it was assumed that the slackness was due to the heavy Christmas expenditure. While to a limited extent there may be some justification for this assumption, the extraordinary results of the recent new issues show that money is speedily forthcoming when there is a prospect of a profit or a good yield. In the past week alone, prospectuses for a nominal total sum of over £8,000,000 have been advertised; and without taking into account that many of the issues were over-subscribed, the application money probably amounted to £1,000,000.

Markets were by no means weak, and some sections showed decided strength. This was the case with Oils, Tobaccos, and Argentine Rails. Gilt-edged stocks were firm all round, and War Loan, Consols, and Conversion Loans were in good demand. The Newcastle loan was dealt in for the first time on Monday at a small discount. The Nottingham issue appeared at the week-end, and a successful result is anticipated.

The reports from the Gas Market showed a further hardening in the prices at which dealers were willing to sell, but the transactions recorded were much less than they have been lately. The Gas Light ordinary advanced ½ point to 84½-86½, and the South Metropolitan ordinary 1 point to 93-95. This confidence is apparently not reflected in the Provinces and at the local exchanges. Bristol maximum and the three Sheffield stocks all fell 1 point, Liverpool ½ point, and Newcastle ½ point. Events in China are evidently affecting the Hong Kong and China Company's shares, which dropped 2 points to 14½-15½.

The Reading Gas Company have deposited a Bill for next session asking for powers to raise £200,000 additional capital with the right to borrow to the extent of one-half of their issued paid up capital. It is proposed that the present maximum dividend of 5 p.ct. be raised to 6 p.ct. on capital issued after the passing of the Act.

The following transactions were recorded during the week:

On Monday, Bournemouth "B" 12⅝, 12¾, British 105½, Cape Town 4½ p.ct. debenture 71½, Continental Union 28, 30½, Croydon maximum dividend 79, 80, European 6⅝, Gas Light and Coke 85, 85⅛, 85¼, 85⅜, 85⅝, 85⅞, 4 p.ct. preference 75⅛, 76, 76½, Hornsey 3½ p.ct. 70, Imperial Continental 129, 130, Primitiva 13s. 3d., 13s. 6d., 13s. 7½d., 13s. 9d., 13s. 10½d., South Metropolitan 93½, 93⅝, 94, Tottenham 3½ p.ct. 91.

On Tuesday, Cape Town 4½ p.ct. debenture 72½, Gas Light and Coke 85¼, 85⅜, 85⅝, 3 p.ct. debenture 58½, Hong Kong 16, Primitiva 13s. 3d., 13s. 4½d., 13s. 6d., 13s. 7½d., 13s. 9d., South Metropolitan 94½.

On Wednesday, Commercial 4 p.ct. 81, Gas Light and Coke 85⅛, 85¼, Hong Kong 15⅝, 16, Imperial Continental 131½, Montevideo 80½, 81, Primitiva 13s. 4½d., 13s. 6d., 13s. 7½d., South Metropolitan 94½.

On Thursday, Alliance 81⅜, European 6½, Gas Light and Coke 85⅛, 85¼, 85⅜, 3 p.ct. debenture 58½, Imperial Continental 130, Primitiva 13s. 3d., 13s. 4½d., 13s. 5½d., 13s. 6d., 4 p.ct. debenture 71½, 71⅝, South Metropolitan 93⅜, South Suburban 98. Supplementary prices, Croydon 4 p.ct. debenture 72½, 73¼, Southend-on-Sea 5 p.ct. new 83¼.

On Friday, Bournemouth 5 p.ct. 12⅝, 12¾, Colombo 7 p.ct. preference 21s. 6d., 21s. od., Commercial 4 p.ct. 80, Gas Light and Coke 85⅛, 85⅜, 85⅝, 86, 3½ p.ct. 60⅜, 3 p.ct. debenture 58⅛, 58⅜, Hong Kong 15, 15¼, Imperial Continental 131½, Montevideo 80⅜, 81½, Primitiva 13s. 3d., 13s. 6d., 13s. 7½d., South Metropolitan 94½, 95, 6½ p.ct. debenture 100½, 101½.

In Lombard Street ample funds were available. The clearing banks adhered to 4 p.ct. for regular market loans, but from other lenders renewals were obtained at 3¾ p.ct. Fresh money was towards the close offered down to 2½ p.ct., but loans over the turn of the year commanded as high as 5 p.ct. The Treasury Bill rate took an upward turn; the average being £4 12s. 8·86d. p.ct., or nearly 1s. 2d. p.ct. above the average for the previous week. The increase had a steadying effect on discount quotations.

The Foreign Exchange Market was extremely quiet. A point of interest was the relapse in the German Exchange, which finished at 20.37½—a level which indicated probable gold purchases this week. Both French and Italian currencies moved within narrow limits. The former closed at 121.⅜, and the latter at 108⅛. Belgas improved slightly to 34.89, and Sterling on New York declined to 4.85⅝.

Silver was quiet, and the cash price declined ⅛d. to 24⅜d. per oz. There was no gold available at the end of the week, and the price remained at 84s. 11½d. per oz.

The Bank Rate is 5 p.ct., to which it was raised from 4 p.ct. on Dec. 3, 1925. Bankers' deposit rates are 3 p.ct. The deposit rates of the discount houses are 3 p.ct. at call and 3¼ p.ct. at notice.

| Issue. | Share. | When ex-Dividend. | Dividends. Prev. Hf. Yr | Dividends. Last Hf. Yr. | NAME. | Quotations. Dec. 17. | Rise or Fall on week. | Transactions Lowest and Highest Prices. |
|---|---|---|---|---|---|---|---|---|
| £ | | | % p.a. | % p.a. | | | | |
| 171,978 | Stk. | Aug. 12 | 5 | 5 | Aldershot 5 p.c. max. C. | 72—75 | .. | .. |
| 229,992 | " | " | 4 | 4 | Do. 4 p.c. Pref. | 65—70 | .. | .. |
| 1,551,868 | " | Sept. 30 | 6½ | 6½ | Alliance & Dublin Ord. | 81—86 | .. | 81½ |
| 774,000 | " | July 8 | 4 | 4 | Do. 4 p.c. Deb. | 67—70 | .. | .. |
| 300,000 | 1 | Oct. 14 | 1/7½ | 1/7½ | Bombay, Ltd. | 1—1¼ | .. | .. |
| 170,000 | 10 | Aug. 26 | 8½ | 8½ | Bournemouth 5 p.c. | 12—13 | .. | .. |
| 600,050 | 10 | " | 7 | 7 | Do. B 7 p.c. | 12—13 | .. | 12⅝—12¾ |
| 275,000 | 10 | " | 6 | 6 | Do. Pref. 6 p.c. | 11—12 | .. | 12⅝—12⅞ |
| 60,000 | Stk. | June 24 | 3 | 3 | Do. 3 p.c. Deb. | 54—57 | .. | .. |
| 189,025 | " | " | 4 | 4 | Do. 4 p.c. Deb. | 74—77 | .. | .. |
| 214,740 | " | Aug. 26 | 12 | 12 | Brighton & Hove Orig. | 168—168 | .. | .. |
| 244,200 | " | " | 9 | 9 | Do. A Ord. | 126—130 | .. | .. |
| 1,387,500 | " | July 22 | 5 | 5 | Bristol 5 p.c. max. | 84½—85⅛ | .. | .. |
| 855,000 | " | Sept. 30 | 7 | 8 | British Ord. | −1 | .. | .. |
| 100,000 | " | June 24 | 7 | 7 | Do. 7 p.c. Pref. | 102—107 | .. | .. |
| 120,000 | " | " | 4 | 4 | Do. 4 p.c. Red. Deb. | 114—119 | .. | 105½ |
| 100,000 | 10 | Dec. 9 | 8 | 6 | Cape Town, Ltd. | 68—73 | .. | .. |
| 100,000 | 10 | Oct. 28 | 4½ | 4½ | Do. 4½ p.c. Pref. | 7—8* | .. | .. |
| 150,000 | Stk. | June 24 | 4½ | 4½ | Do. 4½ p.c. Deb. | 6—7 | .. | .. |
| 696,860 | " | July 22 | 6 | 6 | Cardiff Con. Ord. | 68—73 | .. | .. |
| 387,860 | " | June 24 | 7½ | 7½ | Do. 7½ p.c. Red. Deb. | 96—99 | .. | 71¼—71½ |
| 157,150 | " | Aug. 12 | 6⅜ | 6⅜ | Chester 5 p.c. Ord. | 92—102 | .. | .. |
| 79,185 | 1 | Sept. 30 | 5 | 5 | Colombo Ltd. Ord. | 89—94b | .. | .. |
| 24,495 | 1 | " | †2/- | †2/- | Do. 7 p.c. Pref. | 27/—29/- | .. | .. |
| 321,490 | 1 | Oct. 14 | 1/4⅜ | 1/4⅜ | Colonial Gas Assn. Ld. Ord. | 25/—27/- | .. | 21/6—21/9 |
| 178,900 | 1 | " | 1/9⅜ | 1/7½ | Do. 8 p.c. Pref. | 21/—23/- | .. | .. |
| 1,513,280 | Stk. | Aug. 1 | 1/9⅜ | 1/7½ | Commercial 4 p.c. Cap. | 78—81 | .. | .. |
| 560,000 | " | " | 5½ | 5½ | Do. 3½ p.c. Cap. | 76—79 | .. | 80—81 |
| 475,000 | " | " | 5/8/4 | 5/8/4 | Do 3 p.c. Deb. | 55—58 | .. | .. |
| 800,000 | " | June 24 | 3 | 3 | Continental Union, Ltd. | 27—32 | .. | .. |
| 300,000 | " | Sept. 30 | §2 | §1 | Do. 7 p.c. Pref. | 82—85 | .. | 28—30½ |
| 787,150 | " | " | 7 | 7 | Croydon sliding scale | 96—99 | .. | .. |
| 403,100 | " | Aug. 12 | 6½ | 6½ | Do. max. div. | 78—81 | .. | .. |
| 492,270 | " | " | 5 | 5 | Derby Con. | 107—109e | .. | 79—80 |
| 55,000 | " | Aug. 26 | 9 | 6 | Do. Deb. | 78—75e | .. | .. |
| 209,000 | " | June 24 | 4 | 4 | East Hull Ord. 5 p.c. | 73—82 | .. | .. |
| 50,000 | " | Sept. 16 | 5 | 5 | Eastbourne 5 p.c. Deb. | 91—96 | .. | .. |
| 1,002,180 | " | June 24 | 5 | 5 | European, Ltd. | 6¾—7½ | −⅛ | 6⅝—6¾ |
| 13,788,960 | Stk. | Sept. 30 | †4 | †3 | Gas Light & Coke 4 p.c. Ord. | 84½—85⅛ | +⅛ | 85 ex 86 |
| 2,600,000 | " | Aug. 12 | 4/17/4 | 5/1/4 | Do. 3½ p.c. max. | 58—61 | .. | 60⅜ |
| 4,157,020 | " | " | 8½ | 8½ | Do. 4 p.c. Con. Pref. | 74—77 | .. | 75½—76½ |
| 5,602,620 | " | June 24 | 4 | 4 | Do. 3 p.c. Con. Deb. | 58—61 | .. | 58—58½ |
| 181,315 | " | " | 3 | 3 | Do. 6 p.c. Br'sf'd Rd. Db. | 100—105 | .. | .. |
| 180,000 | " | " | — | 6 | Do. 10 p.c. Bonds. | .. | .. | .. |
| 42,000 | " | — | 10 | 10 | Do. 7½ p.c. Ilford Deb. | .. | .. | .. |
| 82,500 | " | Aug. 26 | 7½ | 7½ | Hastings & St L. 5 p.c. Conv | 87—92 | .. | .. |
| 268,740 | " | " | 6½ | 6½ | Do. 3½ p.c. Conv. | 66—71 | .. | .. |
| 70,000 | 10 | Oct. 14 | 5½ | 5½ | Hongkong & China, Ltd. | 14½—15½ | −2 | 15—16 |
| 178,200 | Stk. | Sept. 16 | †10 | †10 | Hornsey Con. 3½ p.c. | 69—71 | .. | 70 |
| 1,976,000 | " | Nov. 11 | 5 | 5 | Imperial Continental Gas. | 129—132 | .. | 129—131½ |
| 226,170 | " | Aug. 12 | 10 | 10 | Do. 8½ p.c. Red. Deb. | 68—71 | .. | .. |
| 235,242 | " | Aug. 12 | 8½ | 8½ | Lea Bridge 5 p.c. Ord. | 94—99 | .. | .. |
| 3,127,840 | " | Aug. 12 | 6½ | 6½ | Liverpool 5 p.c. Ord. | 79½—80½b | −½ | .. |
| 600,000 | " | Sept. 30 | 5½ | 5½ | Do. 7 p.c. Red. Pref. | 102—105b | .. | .. |
| 165,786 | " | Aug. 26 | 7 | 7 | Maidstone 5 p.c. Cap. | 112—117 | .. | .. |
| 63,480 | " | June 24 | 3 | 3 | Do. 3 p.c. Deb. | 53—58 | .. | .. |
| 75,000 | 5 | Dec. 9 | †7 | †7 | Malta & Mediterranean | 5½—5⅝* | .. | .. |
| 541,920 | Stk. | Nov. 25 | †6 | †5 | Montevideo, Ltd. | 79—83 | .. | .. |
| 2,061,815 | " | Aug. 12 | 5 | 5 | Newcastle & Gateshead Con. | 71⅜—72½d | −¼ | 80½—81½ |
| 360,929 | " | " | 4 | 4 | Do. 4 p.c. Pref. | 73—74d | .. | .. |
| 529,705 | " | June 24 | 3½ | 3½ | Do. 3½ p.c. Deb. | 68½—69½d | +½ | .. |
| 15,000 | " | Aug. 26 | 11½ | 11½ | North Middlesex 10 p.c. | 155—160 | .. | .. |
| 91,530 | " | " | 8⅝ | 8⅝ | Do. 7 p.c. | 109—114 | .. | .. |
| 300,000 | " | Nov. 25 | 7 | 9 | Oriental, Ltd. | 97—102 | .. | .. |
| 188,120 | " | June 24 | 7¼ | 7¼ | Plym'th & Ston'house 5 p.c. | 108—113 | .. | .. |
| 414,500 | " | Aug. 26 | — | 7/4/0 | Portsm'th Con. Stk. 4p.c. Std. | 102—107 | .. | .. |
| 236,732 | " | " | — | 5/0/0 | Do. 5 p.c. max. | 78—81 | .. | .. |
| 2,289,909 | 1 | " | — | — | Primitiva Ord. | 18/—14/- | .. | .. |
| 282,200 | 100 | Dec. 1 | 4 | 4 | Do. 4 p.c. Red. Deb. | 84—86 | .. | 18/3—18/10½ |
| 600,000 | Stk. | July 22 | 4 | 4 | Do. 4 p.c. Red. Deb. 1911 | 70—72 | .. | .. |
| 434,963 | " | — | — | — | Do. 4 p.c. Cons. Deb. | 70—72 | .. | 71½—71⅝ |
| 150,000 | 10 | Sept. 30 | 6 | 6 | San Paulo 6 p.c. Pref. | 7½—8 | .. | .. |
| 195,000 | 50 | July 1 | 5 | 5 | Do. 5 p.c. Red. Deb. | 48—49 | .. | .. |
| 270,000 | Stk. | Sept. 16 | 6 | 5½ | Sheffield A | 96—98d | .. | .. |
| 419,968 | " | " | 6 | 5½ | Do. B | 96—98d | −1 | .. |
| 1,047,000 | " | " | 6 | 5½ | Do. C | 96—98d | −1 | .. |
| 90,000 | 10 | June 11 | 4 | — | South African | 96—98e | −1 | .. |
| 5,609,895 | Stk. | Aug. 12 | 7 | 5 | South Met. Ord. | 4—6 | .. | .. |
| 1,895,445 | " | July 8 | 3 | 3 | Do. 3 p.c. Deb. | 93—95 | .. | .. |
| 734,000 | " | Sept. 16 | 6½ | 6½ | Do. 3 p.c. Deb. | 57—60 | +1 | 93½—95 |
| 91,500 | " | Aug. 12 | 8½ | 8½ | Do. 6½ p.c. Red. Db. | 100—102 | .. | .. |
| 1,187,795 | " | Aug. 12 | 6½ | 6½ | South Shields Con. | 114—116d | .. | 100½—101½ |
| 868,837 | " | June 24 | 5 | 5 | South Suburban Ord. 5 p.c. | 96—99 | .. | .. |
| 647,740 | " | Oct. 14 | 5 | 5 | Do. 5 p.c. Deb. | 92 - 95 | .. | 98 |
| 121,275 | " | June 24 | 4 | 4 | South'mpton Ord. 5 p.c. max. | 75—78 | .. | .. |
| 250,000 | " | Aug. 26 | 7 | 7 | Do. 4 p.c. Deb. | 68—73 | .. | .. |
| 200,000 | " | June 24 | 6½ | 6½ | Swansea 7 p.c. Red. Pref. | 100—102 | .. | .. |
| 130,000 | " | July 22 | 7½ | 7½ | Do. 6½ p.c. Red. Deb. | 100—102 | .. | .. |
| 882,275 | " | " | 5½ | 6½ | Tottenham District A 5 p.c. | 105—110 | .. | .. |
| 150,000 | " | " | 5½ | 5½ | Do. B 3½ p.c. | 88—91 | .. | .. |
| 181,255 | " | Dec. 9 | 4 | 4 | Do. 5½ p.c. Pref. | 99—101 | .. | 91 |
| 258,251 | " | Aug. 26 | 5 | 5 | Do. 4 p.c. Deb. | 72—75* | .. | .. |
| 197,294 | " | Aug. 26 | 6⅝ | 6½ | Tynemouth Con. and New | 69½—70½d | .. | .. |
| 88,330 | " | " | 5 | 5 | Uxbridge, Maidenhead, & Wycombe 5 p.c. | 85—90 | .. | .. |
| 91,800 | " | " | 6⅝ | 6½ | Do. 5 p.c. pref. | 80—85 | .. | .. |
| 80,000 | " | July 8 | 8½ | 8½ | Do. 5 p.c. Maidenh'd | 85—90 | .. | .. |
| 255,636 | " | " | 7 | 7 | Wandsworth, Wimbledon, and Epsom— | | | |
| 412,450 | " | " | 5/19/0 | 5/19/0 | Wandsworth A 5 p.c. | 122—127 | .. | .. |
| 352,000 | " | " | 6⅝ | 6⅝ | Do. B 3½ p.c. | 102—107 | .. | .. |
| 98,000 | " | " | 7½ | 7½ | Do. C and New | 88—93 | .. | .. |
| 88,416 | " | June 24 | 3 | 3 | Wimbledon 5 p.c. | 98—103 | .. | .. |
| | | | | | Epsom 5 p.c. | 104—109 | .. | .. |
| | | | | | 3 p.c. Deb. | 54—57 | .. | .. |

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